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OF THE

Royal Army Medical Corps

EDITED BY

COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

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THE EAST AND ITS WAYS: A STUDY OF THE IMPERSONAL.

By COLONEL SIR ROBERT H. FIRTH, K.B.E., C.B.

THAT so many members of the Corps serve long in the East is the main justification for this article. Some time ago,[1] I published in this Journal two papers upon our Aryan brother. They dealt mainly with his religion and his philosophy. In these pages I propose to discuss other aspects of his life and outlook upon the world. I do not claim infallibility for my various inferences or deductions, and doubtless some of them are open to criticism, but, as the expression of thoughts and impressions formed in the course of service in the East, they may be of interest to others. If, at times, I appear severe upon the Oriental it must not be assumed that I lack sympathy with him; on the contrary, it is rather by our appreciation and correction of what seems to me to be his fundamental misfortune that I am hopeful of his future.

I.

To begin with, few Orientals have the distinction of a birthday as celebrated by ourselves. He or she is ushered into the world in a curiously impersonal manner, for the only special honour permitted is that of a birth-year, and from the moment of birth he or she is spoken of as a year old, and this same age continues till the beginning of the next calendar year which may occur only a few days later. When that day arrives he or she is credited with another year. There are obvious disadvantages in being considered from one's birth at least one year or possibly two older than one really is, but such is Oriental custom and it explains the well-known fact that few Orientals have an exact knowledge as to how old

[1] July and October, 1912.

they are. The Oriental fares hardly better in the matter of marriage, for he is permitted no say in the affair; in fact, it is not his affair at all, but his parents'. His revenge for being thus sold out of what ought to be the better part of his life, he takes eventually on his own children. Probably, to most Orientals, his death is the most important act of his life, for then only can his personal existence be considered properly to begin. Particularly is this so if he happens to be a Chinaman, as by death, according to those people, he joins the great company of ancestors who to them are of more consequence than the living and certainly of more individual distinction. If he be as sentient, when dead, as many suppose then the defunct must feel that his earthly life has indeed ended well.

With the familiar landmarks of life, birth, marriage and death, obliterated in this manner, it is not surprising that many Orientals deem separate existence but the shadow of a shade, and that, to them, life presents itself as a totally different affair from what it seems to us. This is further accentuated by the circumstance that to many Orientals the real social unit is the family rather than the individual. From a maharajah on his *gaddi* to the coolie in his hovel it is the idea of kinship that knits the entire body politic together. The race is one great family and the family is a little kingdom. The one developed out of the other and finds everyday expression in *bhai* and *bhaiband*. This exaggerated concept of the family is but an aspect of the incrdinate desire inherent in every Oriental for the perpetuation of the family line. Every infant is regarded merely in the light of a possible progenitor, with the result that a boy baby is already potentially a father, whereas a girl, if she marry at all, is bound to marry out of her own family into another and be relatively lost. The full force of this latter possibility is tempered by the practice of adoption whereby not infrequently a son-in-law or a stranger may for family reasons be adopted as a real son and even thus become the head of a family. This often happens when there are either only daughters or no children. There is a comic side to the practice, as since people are by no means averse to being adopted, the power of the head of a family to adopt anybody whom he will gives him more voice in the matter of what is really his unnatural offspring than he ever had in the selection of a more natural one. Further, a man adopting another to-day may unadopt him a few weeks later and replace him by somebody else. I never knew of this being done in India, but am informed that it is not rare in China and Japan. It suggests that social identity must be profoundly unimportant to those peoples, or it may be but a custom devised to afford some slight preparation in this world for a future transmigration of souls. It is to be hoped that there exists in those lands sufficient popular prejudice to interpose some limit to this mode of acquiring children. We Westerns are open to the reproach of a falling birth-rate, and both we and the Oriental respectively, perhaps for different reasons, should bear in mind that a trifling predilection for the real thing in sonships is vital, even to the continuance of the artificial

variety. Obviously, if one generation ever went in exclusively for adopting others as children, there would be no subsequent generation to adopt.

If a young Oriental belong to the lower or middle classes, he is usually set to learn a trade as soon as his schooling is over. Nine times out of ten it is the father's trade which he learns. To learn any other would be preposterous, for is he not the son of his father and heir therefore of the paternal skill? This inherited aptness is taken for granted, and any possible inheritance of abilities from the mother's side is ignored, while as for the youth's individual predilection regarding a choice of calling he has none. He becomes a *mistri* because his ancestors always have been carpenters. Here we see the element of caste and the custom whereby a man is born to his trade, not selected naturally because of his fitness for it. If our hypothetical youngster be born of bluer blood, or be filled with the same desires as if he were so descended, he becomes a student. With an application which is usually far in excess of that which his Western brother displays under similar circumstances, our young Oriental studies for the law or such subjects as will gain him a clerkship under a paternal Sirkar. As might be expected, many end by discovering in the Western knowledge which they study meanings and teachings quite inapplicable to the Eastern environment. The attainment of a proper perspective comes quickly to some with consequent increase of happiness and contentment, while to others the intellectual indigestion is fraught with many heartburnings and years of doubting and disappointed hopes. Setting aside these difficulties as to the acquirement of a suitable training or calling and irrespective of his social status, it may be assumed that the young Oriental by this time has reached a period of life when his thoughts lightly turn to love and courtship. This is the period in our lives when the world within excludes the world without, and many of us do so with a reckless trust in our own self-sufficiency which is almost sublime. The thoughts we have never dared breathe to any one before find a tongue for her who seems destined to understand, and our personality sweeps forth in an uncontrollable rush. The most reticent becomes confiding, the most self-contained expands. For once all is possible, nothing lies beyond our reach, and as we talk, and she listens, whatever doubts may have marred our imaginings disappear before the smile of our chosen's appreciation. It is no overdrawn picture and yet one, doubtless, in greater or lesser degree, familiar to every reader. Often, during my service in the East, have I wondered how much such experiences fall ever to the Oriental young man. I may be wrong, but I doubt whether such blissful infatuation ever falls to his lot; if it does, then only illicitly. In the Western sense, he is never the dupe of his own desire and the willing victim of his self-illusion. He fails to feel that incitement to be what he would seem to be and to become what she deems becoming. Custom has so far fettered fancy that he has nothing to tell and has no wish to communicate his aspirations. While she—she needs no ears to hear, for she is not his love,

but only his wife, and never was anything else. The choice of a bride is not his, nor of a bridegroom hers, because marriage in the East is but a species of investment contracted by the existing family for the sake of the prospective one, the actual participants being only lay figures in the affair.

The practice of early marriage and the custom of having one's wife chosen for one by relatives, as prevails in the East, raises some interesting points from the aspect of evolution. The outcome of this choosing must be at the best nothing more than unobjectionable mediocrity, associated with a deadening influence upon that individuality of the chief actors which we deem to be of the very essence of marriage. If this be the immediate influence on the man and woman, the eventual effect on the race must be considerable because it is not simply an exposition of the impersonal state of things but it is a power toward bringing such a state of things about. A man who is tied to someone that remains toward him as a cipher must lack surroundings inciting to psychological growth, and the same is true of the woman, and neither are more favourably circumstanced because their forebears had been similarly circumscribed. The Western custom brings natural selection into play and by reason of psychical similarity determining the selection of mate there should result an increase in the personality of the race. In general terms, the Western custom results in like meeting with like, that is as to psychical attributes, but of course there are exceptions as it is well known that some connubial couples are often anything but twin souls. Mere physical attraction is another matter. Nature sanctions physical incongruities while she discountenances the psychical; moreover, the physical development of the human body would seem to have ceased to be an object with her, but rather all her care is directed to the evolution of the mind. In respect of amativeness, the field of competition is thus transferred from matter to mind and advantageous psychical variations are seized upon and perpetuated with the same zeal as was directed formerly to physical variations. If opposites only were to fancy and wed one another such advantageous improvements would soon be lost or neutralized, and to prevent this Nature gives man a desire for resemblance, which desire he acts upon if given a free hand. I do not wish to imply that complete compatibility of temperament is to be desired, on the contrary, as it would defeat its own end and allow no room for variation. Further, any desire for conjugal resemblance between a mated couple makes for companionship and it is the apparent absence of companionship in Oriental couples which has always impressed me. Where custom requires a wife to follow dutifully in the wake of her husband whenever the two go out together gives small opportunity for intercourse by the way. Even in the privacy of the home the separation of the two seems to be no less marked. Such a semi-attached relationship cannot conduce to much mutual understanding, nor operate favourably toward the development of advantageous psychical

variations in the children and the expression of individuality. There is apparently no place in the Oriental social scheme for so particular a thing as the ego.

II.

I well recall my first tour of duty in the East and my efforts to grasp the language, manners, customs and mentality of the people around. To me, they seemed to see everything topsy-turvy and their world appeared to be a curious antithesis of my own. To write backwards, read backwards, and even speak backwards seemed but the elements of this contrariety. The inversion extended deeper than mere modes of expression and involved the very matter of thought. Private ideas of my own found no home among them and methods which struck me as unnatural appeared to be their birthright. And yet, in spite of all their eccentricities, I recognized that they were men and human beings of no mean order. Gradually, I perceived in the Oriental point of view a new importance, for, if the Oriental's mind-picture of the world be placed side by side with our own, the two aspects in combination will yield results beyond what either alone can afford. I used to think and am inclined to think now that the East is only half civilized, but in the sense of what might have been, not of what is and, in expressing this opinion, I say half-civilized, not in comparison with ourselves but with the eventual possibilities of humanity. I doubt whether either the Western or the Eastern system is perfect enough in all things to serve as a standard for the other. The light of truth has reached the Western and the Eastern races through the medium of their own mental crystallization, and this has prolonged it in opposite ways, so that the rays that are light to the eyes of the one produce only darkness to those of the other. I have known intimately many Orientals of all social grades and the great impression left on me has been that, in politeness, delicacy and self-restraint they have no equal, and that in these and some other respects the Oriental civilization is the equal of our own. And yet there is a difference, and the real difference lies not in the externals or the polish but in the substance polished.

Take the case of social intercourse. In a land where, at the threshold of a home or room, one begins by removing one's shoes and not by taking off one's hat, the hint is definite that humanity is to be approached by the reverse way. The hint is confirmed when one attempts to reach the mind of the occupant, for thoughts have to be arranged in reverse order from that to which we are accustomed and the same is true of the speech itself. The further one goes the more obscure the whole situation becomes and one seeks for some means by which to re-orientate. We cannot explain the facts on a theory that the Oriental is a case of partially arrested development. It is true that, from the Western standpoint, the Eastern civilization seems suddenly to have come to end, but, looked at closely,

there is much to suggest that it has fully run its course and that we are face to face with a completed race-life. The intellectual machine is not broken, it has run down and development has ceased owing to an intrinsic inability to go on. No matter what Oriental race be taken, we find it frequently rich in the superficial amenities with which we link our idea of civilization. The situation can be likened aptly to some stunted tree that, finding itself prevented or unable to grow, hastens the more luxuriantly to put forth flowers, the intermediate processes being omitted or jumped. The curious and almost universal faculty for imitation which characterizes all the peoples of the East supports the analogy, and what they have grafted bodily upon their ancestral tree has resulted in frequent luxurious and incongruous growth. But like grafts generally, the alien shoots have not been much modified by the sap of the foster-parent stem, neither has the tree in its turn been affected by them. In some cases, the grafts have grown to be great branches but the trunk has remained as the trunk of a sapling. In other words, the nations have grown to man's estate but keeping the mind of their childhood. The net result of all this has been that the Eastern civilization has become little more than a mechanical mixture of social elements, for, in spite of the variety of ingredients thrown into the pot, owing to fusing power being wanting no real combination has resulted. Possibly, this explains the curious incapability to evolve anything new or original which characterizes the East; indeed, the tendency to spontaneous variation seems to have been exhausted and the Eastern races, as they grew old young, have remained much the same ever since. What they were centuries ago, they are, at bottom, to-day; so much so is this the case that, if we were to take away the Western influences of the last fifty years, each Oriental might almost be his own great-grandfather. Certain traits undoubtedly distinguished the Oriental peoples in the past, but these same traits have gradually been their undoing and the most stagnating influence upon their career has been the quality of impersonality.

This quality of impersonality, or negation of a place or part for the ego, has been recognized already as a dominant note in the Oriental social scheme, it is present in every Oriental language and in many of the Eastern religions. The characteristic is curious as a fact and not uninteresting as a factor, for what it signifies in respect of Eastern peoples may not be without a lesson or help to ourselves, for it lies at the bottom of that silence of those who think, called unbelief, and the petulant cry of those who do not think, called socialism. If the ego be but the passing shadow of the material brain and individuality a delusion of the mind, then what remains to man as a motive potent enough to rouse endeavour? If we take away the stimulus of individuality then action is paralysed; if we destroy the force of promptings of personal advantage then socialism is not only justified but becomes an axiom of life and the community becomes the unit. That the Oriental, saturated with his numbing imper-

sonality has not reached this state is at least suggestive that individuality is a fact. However that may be, most certainly to all races of men there has come the realization of self and of individual identity; doubtless the degree in which they have felt its force has differed much. Still, it is there, and in some cases it has proved to be an ever present undesirable double. And yet, how many of us are prepared to forego our own self? Close upon the heels of the existing consciousness of self treads the shadowing doubt of its hereafter. We are consoled by the thought, that mind should be capable of annihilation is as inconceivable as that matter should cease to be. What prophets preached in the past, so modern science teaches to-day. Satisfied then on this point, we can say that for the Western the personal consciousness of which he is aware is bounded by two twilights or impersonal states; the one the infantile existence, which precedes his boyish discovery of self, and the other the gloom that grows with years. To the Oriental life is all twilight, and to him with the present unconsciousness of the babe exists the belief in a coming unconsciousness for the man. The known truth of the one seems to carry with it the warranty for the other. It is difficult to believe that we are wrong and that the East is right. Its seeming wisdom supports rather the precociousness of what is destined never to go far, and that the Easterns are still in that childish state of development before self-consciousness has spoiled the sweet simplicity of youth. An impersonal race seems never to have fully grown up.

III.

From the preceding considerations it would seem that the dissimilarity between the Western and the Eastern attitude of mind depends upon something beyond the effect of mere environment. The clue to the dissimilarity is the part which the principle of individuality plays in the drama of evolution or, put in other words, individuality bears the same relation to the development of mind that the differentiation of species by spontaneous variation bears to the evolution of organic life. What spontaneous variation is to the material organism, so individuality in the guise of imagination is apparently to the mental. Spontaneous variation is constantly urging the animal or plant to make new ventures which are restrained or kept in bounds by environment and the operation of the law of survival of the fittest; in a similar way, imagination is ever urging man's mind on to other concepts, while common sense or the average sense of the community is as steadily keeping it in restraint. The surviving products in the one case are species of animals or plants, and, in the other, individualities. It may be asked, what do I mean by individuality? I mean that group of ideas, thoughts and aspirations which go to make up our separate identity, and by virtue of which we recognize ourselves as ourselves and as something distinct from our neighbours. Individuality,

personality, and the sense of self are only aspects of one and the same thing which we call the soul, according as to whether we regard it from an intrinsic, an altruistic or an egoistic point of view. Now man as he develops mentally becomes more and more distinct from his neighbour, and this inevitable differentiation implies that the man shall be sensible of it. Further, the necessary attribute of mental action is consciousness, and not to be conscious of one's self is not to be, while the effect of that self upon the consciousness of others is personality.

Reflection indicates that the cause of this mentality is imagination or the image-making faculty which plays so large a part as creator of the world within. It is this faculty which is the source of all that is new in thought and the great mainspring of psychical advance, reason being the balance wheel duly comparing what we imagine with what we know and giving us answers in terms of the here and now, which we call the actual. No matter what branch of thought we examine, it is imagination that has been and is the moving spirit. The actual is really nothing but the local, for it does not mark the limits of the possible, and it is to imagination that we owe visions of the possible. It is imagination which has been spinning and weaving all the fabrics of human thought; from the most concrete of inventions to the most abstract of conceptions the same force reveals itself. History tells the same story, for it has been imagination and not the power of observation which has been the cause of mind evolution. Many savages can reason absolutely but they break down before problems a little out of their beaten path, and all because their forefathers had not the power to imagine something beyond what they actually saw. The very essence of imagination lies in its ability to change a man's environment for him and, for this reason, man is free as nothing else in the world is free. What has been true of individuals has been true of races, and it is the most imaginative races who have played the greatest part in the world's advance.

If imagination be the impulse of which increase in individuality is the first fruit then the East is unimaginative. Such is precisely what the peoples of the East are. All who have been brought in contact with them have observed it. Their matter-of-fact way of looking at things is distressing. I remember well travelling through some remarkably grand and picturesque parts of India and, on appealing to some Indians with me as to their appreciation of what they saw, I was impressed with the complete lack of response on their part to any of the stimuli which were acting upon my own mind. Their speech shows the same prosaic character, for their languages are paralleled by their whole life. Certainly, originality is not the strong point of the East and the numbing force of impersonality is the cause. The question presents itself, this may be true of the past and perhaps of the present, but is it going to be so always? I think not. So forcible now is the attack of Western civilization upon the centres of Eastern trade that the mentality of the peoples is

undergoing a series of shocks, and these shocks are depolarizing the constituent elements which make up their civilization. The Altaic races are responding more quickly perhaps to Western stimuli than are the Indo-Aryan peoples. But, throughout the East, there is slowly evolving a reaction against the impersonal and little by little we should see among all those peoples more individualism. It is to be hoped so, because under no scheme of progress can it be shown that impersonality is man's earthly goal. The present condition of the Eastern masses is the witness, for if they continue in their present state they are not of those who will survive. Unless their newly imported ideas really take root, their Nirvana will indeed be realized as the shroud of those whose day was but a dawn and of those whose lands were only the lands of the day's beginning.

THE TEACHING OF ARMY HYGIENE AS AN AID TO MILITARY EFFICIENCY.

ROYAL ARMY MEDICAL CORPS SCHOOLS OF SANITATION, AND INSTRUCTION IN THE FIELD.

By CAPTAIN S. H. DAUKES, O.B.E.
Royal Army Medical Corps (T.).
The Wellcome Bureau of Scientific Research.

MILITARY success depends upon many factors besides the "force of arms"; organization, transport, intelligence, supply and hygiene all play an important part. It is difficult to say that any one of these accessory factors plays a predominant part in determining the issue, but history has shown again and again the power of disease to decide the fate of armies. Up to the time of the late war statistics had shown an enormous preponderance of death and disability caused by sickness over that resulting from enemy action. This proportion had been disturbed by the increasing lethal power of modern offensive methods, but at the outbreak of the late war disease still constituted the greatest menace to armies in the field. Moreover, in view of the fact that such danger increases in proportion to the number of troops engaged, it was realized that both in the West and East—more especially the latter—sanitation was the key to success.

The responsibility for such precaution could not be confined to any one branch or grade in the Army; the need was universal as also was the responsibility.

The Army Medical Service could instruct, advise, exhort, but alone it was absolutely unable to cope with the problem, and regulations were made which emphasized the responsibility of all units and ranks, under their respective commanding officers, with regard to such matters.

In many ways also the Army was face to face with an entirely new problem. Hitherto war had been waged by a regular army specially trained for such emergency, and fully instructed in all matters relating to health under the abnormal conditions of a war of movement.

In the late war the regular was, to a large extent, replaced by the temporary soldier, a man whose life had been spent in office, workshop or mine, with all the conveniences of civilization to hand and a sanitary knowledge in inverse proportion to the rates which he had paid. Moreover, the type of warfare brought problems of its own; men fought in shell holes and in waterlogged trenches, they were compelled to live in "dug-outs" deep down in the ground, where all matters of conservancy and ventilation presented new difficulties.

The war was world wide, and men were fighting in the waterlogged wastes of Flanders, in the marshy valleys of Macedonia, in the wildernesses

of Mesopotamia, in the deserts of Egypt, in the hills and valleys of Palestine and in the tropical forests of Africa. Each sphere of operations presented its own set of problems, upon the solution of which depended the whole success of the campaign.

The teaching of experience is thorough and, for pioneer work, often necessary, but it is generally costly;. and at the earliest possible date lessons learned in this hard school must be translated into lectures and demonstrations for the benefit of those who come after. One of the most useful lessons of the war, in preventive work, has been the value of schools and demonstration centres, where all ranks can be taught the dangers they are likely to encounter and the best method of dealing with such dangers. The system of education must be an elastic one and should embrace every unit and every grade in the Army.

Experience has shown that this system should include six distinct spheres of work:—

(1) *Routine Training.*—Schools of hygiene and cookery at home, with adequate camp training.

(2) *Special training* in sanitary supervision, water duties, incineration, entomological work, disinfestation, etc.

(3) *Local Training.*—Demonstration centres in the field, showing the local conditions with reference to special dangers and difficulties.

(4) *Revision courses* in the field, given to men resting or temporarily withdrawn from the line.

(5) *Popular lectures* to men and officers, also propaganda work by means of pamphlets and posters.

(6) Constant *discipline* in all matters relating to sanitation in the field.

With such a system it has been found possible not only to enable men to fight in districts which might have proved veritable death traps, but even to stimulate to enthusiasm many who hitherto had regarded sanitation as synonymous with latrines, and water sterilization as the pastime of the faddist.

Routine Training.

Routine training in army sanitation must take place before the soldier goes overseas. It forms part of the general scheme of training, but as far as possible should be divorced from the more purely military side. A multiplicity of drills, fatigues and route marches during the course of sanitary training has proved a distinct obstacle to success in those schools where it has been allowed to encroach.

A properly constituted school should be capable of dealing with classes drawn from any grade; sanitary specialists should be brought into touch with the most recent work from various fronts; medical officers should receive lectures and demonstrations dealing with their duties in the field; sanitary sections be instructed in the principles and practice of hygiene and elementary brickwork, metal work, carpentry, sketching, etc.; officers,

non-commissioned officers and men be taught the essentials of field sanitation. A well equipped school should show samples of equipment, footgear and clothing; working models of all appliances necessary for sanitary work under every conceivable condition of climate and campaign; food models illustrative of the rations issued under various conditions, also of the different types of unsound food which may demand attention from the medical or commanding officer. There should be a field exhibit showing incinerators, field ovens, latrines, etc., built as far as possible to the actual dimensions; there should be smaller models and diagrams for use in the lecture room. Plaster models and pictures illustrating the various conditions which may be met with—trenches, camping grounds, fly breeding places, etc.—are also of great value.

The course of training at such a school varies with each type of class, from the intensive training of men and officers devoted to purely sanitary work to the short course of lectures and demonstrations given to combatant officers. The fact that the combatant is responsible for carrying out the details of sanitary work must not be lost sight of, and the training of the rank and file must be detailed, even if elementary.

The battalion medical officer is the sanitary adviser to his Commanding Officer, and it is therefore essential for all army medical officers to be well grounded in the principles and practice of army sanitation; they must also be convinced of its importance. Occasionally, in the late war, the work of disease prevention was hampered by the supercilious contempt for sanitation assumed by certain junior medical officers as a cloak for their profound ignorance of the subject. A knowledge of elementary brick work, metal work and carpentry is invaluable to medical officers in the field; and it is also important that they shall be able to interpret correctly and intelligently simple plans and diagrams. These subjects should be included in any course of sanitary training for medical officers. Men and officers for special sanitary work in the field should have a similar but longer course of training: the officers will have to carry out work which corresponds to that of a medical officer of health at home, while the men are to all intents and purposes sanitary inspectors. One of the most important qualities for such men is tact, and every effort must be made during the course of training to emphasize this point, remembering that the possession of this quality has an important bearing upon the fitness of a man for the higher non-commissioned ranks, a point which is frequently decided during the course of training.

In permanent schools established for training under peace conditions a more extended course may, with advantage, be given for revision purposes to senior officers; for those destined to become sanitary specialists, the syllabus should be somewhat similar to an ordinary course for the Diploma in Public Health examination, but modified to suit military conditions. A school undertaking this work needs a much more elaborate equipment for bacteriological and chemical study.

Tropical medicine and hygiene are so closely united that it has been found an advantage, in training medical officers for the tropics, to include the clinical side with the preventive.

This brief summary of the constitution of schools for routine training may be amplified and illustrated by reference to three schools which have been engaged in this work during the late war.

The Duke of York's Headquarters, Chelsea.
(1st and 2nd London Sanitary Companies.)

Repeated and eloquent testimony has been borne to the value of sanitary sections in the field. Many of these sections were trained and equipped at the Duke of York's Headquarters. The type of man enlisted in these companies in the early days of the war was admirably suited to the work: sanitary inspectors, school teachers, architects, surveyors, plumbers, carpenters, and many others with every qualification for success, were enrolled. Sections were urgently needed for the divisions going overseas and the work of equipment and essential instruction in purely military matters considerably limited the opportunity for special sanitary training. Fortunately this disadvantage was, to a large extent, neutralized by the previous knowledge of the men under training. As time went on, however, the supply of experts became exhausted and men were enlisted who were ignorant of the work and often unsuited for it Under such conditions the only hope for success lay in thorough and enthusiastic training, with the power of excluding those whose mental condition rendered them entirely unsuited for this type of work. It also became of vital importance that, as far as the military situation would allow, men should not be removed before the course was completed; much inefficiency in home camps and abroad was due to this cause.

The course of training included lectures, demonstrations, practical classes in water duties, etc., drills, fatigues and other military work. In the early days of the war a definite syllabus of routine training was very difficult to carry out, owing to the fact that recruits were coming in daily, and the demand for fully trained men often necessitated the adoption of emergency and intensive methods of training. This instruction very largely fell to the lot of the officer chosen to command the section, frequently a civilian health officer with little previous experience of army methods. Such a man was well grounded in the principles of disease prevention, but needed help in adapting his knowledge to new conditions, and the series of lectures on "Sanitation in War," delivered at the R.A.M. College and subsequently therefrom issued in book form, was of the greatest assistance in translating his previous ideas into the more robust requirements of active service conditions. The fact that the recruits were absolutely ignorant of ordinary military subjects, such as discipline, drills, marching, etc., presented a great problem, and often this knowledge had to be gained at the expense of sanitary training. There can be little doubt

that men destined for sanitary work should receive the necessary military training before passing to the school of sanitation. If both are taught together there will always be a tendency for one or the other to be neglected. The history of work at this centre also emphasizes another point. Work in a sanitary section is skilled work, work which demands a very high grade both of physical and mental fitness; the later tendency to regard men of a low grade, not only physically but even mentally, as suitable, lowers the status of the work and also defeats the whole scheme of sanitary organization in the field. For members of a sanitary section to fulfil their functions, it is essential that they shall be regarded as experts, instructors and advisers, and not used for ordinary fatigue work; but this will never be possible unless careful discrimination is used in the selection of men for sanitary sections.

At a later stage in the war men were sent to the school in batches, and it became easier to maintain a definite routine of training with the assurance that a man would have time to complete his course of training before being drafted overseas.

An exhibition of incinerators, field cookers, and other apparatus used in the field, was erected so that men could see types of the actual appliances used. Demonstrations of these models were given to all men under training, and classes of combatant and medical officers visited the school to receive practical instruction.

Such training as was received could only be regarded as preliminary to actual instruction in the field: a man may see a Horsfall incinerator and have its structure and working fully explained, but until he has actually carried out the work of assembling and management, his knowledge can only be of the most rudimentary type. One of the great defects in teaching during the earlier part of the war lay in the fact that facilities were not provided for sections to actually put into practice the lessons they had learned until the fully equipped section left headquarters for its work in the field. Many officers and men were absorbed by divisions as advisers on camp sanitation and matters of general hygiene in the field, when they had scarcely seen a camp, and many had never previously slept under canvas. The theoretical knowledge was there, and could be quickly applied to camp conditions, but it would have been far better had practical camp training been included in the syllabus, more especially in view of the importance of first impressions to any unit assuming a position of authority.

School of Army Sanitation, Leeds.

This School was established for training American medical officers, serving with the British Army, in the details of British field sanitation; it was also used for teaching men intended for sanitary duties in the field, and proved of value as a demonstration centre for specialist sanitary officers, and others. Especial stress was laid upon the value of visual teaching,

and, as far as possible, every type of sanitary appliance used in the field was shown.

The course for American medical officers was very limited in time owing to the exigencies of the campaign, and for this reason the type of teaching seemed to be specially suitable. Lectures were freely illustrated by diagrams and models, and were so arranged as to group the various diseases etiologically. Such a classification may present many scientific difficulties, but for the study of the prevention of disease it is invaluable. There is far too great a tendency to regard sanitary measures as belonging to a system totally divorced from medicine. By such separation the subject loses distinction, and is looked down upon; it is only when the close relationship between hygiene and disease is realized that the best results can be obtained. The syllabus was divided into sections, as follows:—

(*a*) *Dealing with the prevention of disease not due to parasitic invasion.*—This section included diseases due to exposure (trench foot, sunstroke, bronchitis, "rheumatism," etc.; diseases due to improper food (beri-beri, scurvy, food-poisoning, etc.); diseases due to equipment or clothing incorrect in itself or in the method of use (sore feet, heat-stroke, etc.); diseases due to poisons, such as nicotine or alcohol. The whole question of rations and equipment was considered, and models were shown illustrating field rations, the vitamine problem, blown tins and other food matters. Samples of equipment, footgear and clothing from every front were shown, and the method of wearing was demonstrated.

(*b*) *Diseases caused by living organisms were divided into four sections.*—(1) *Diseases spread by actual contact,* such as scabies, gonorrhœa, syphilis and smallpox. This portion of the syllabus was introductory, and included a consideration of general preventive measures, such as diagnosis, notification, isolation, treatment and disinfection, in addition to special preventive measures applicable to each disease.

(2) *Diseases spread by mouth-to-mouth infection*—"droplet infection"—such as pulmonary tuberculosis, cerebrospinal meningitis, pneumonic plague and measles. This section included matters connected with ventilation and billeting, in addition to special problems connected with each disease.

(3) *Diseases spread by excrement.*—This group is of special importance to army work, as it includes many diseases which in the past have caused disaster to armies in the field. The danger of typhoid fever, dysentery and cholera can scarcely be overrated, whilst many worm diseases are spread in a similar manner. In this section are included sanitary measures of such importance that there has been a tendency for the casual observer to limit his sanitary outlook to this section alone. The whole question of water supply, storage, transport and purification finds its *raison d'être* in this group of diseases. Latrines, urinals and destructors are designed so as to limit their incidence. Fly destruction, dust suppression, food protection and general cleanliness are also measures directed against

this class of infection. Inoculation is utilized to fortify the individual resistance against any possible breakdown in the scheme of sanitary prophylaxis.

(4) *Diseases spread by means of biting insects.*—A group of ever-increasing importance in military work in the East; which includes malaria, typhus, relapsing fever, phlebotomus fever, trench fever, plague and other diseases of less importance from a military point of view, such as sleeping sickness. Preventive work in these diseases depends chiefly upon measures directed against the insect vectors: abolition of breeding grounds and protection of the individual.

All of these sections were dealt with in lectures and demonstrations illustrated by means of diagrams, pictures and actual working models. In addition, a lecture was given upon the executive and administrative side of the work in the field, with special reference to available personnel and means of getting work done.

The demonstration centre, where all practical classes were held, consisted of an indoor and outdoor exhibition. The former was so arranged that it illustrated all the various points mentioned in the lectures. Plaster models showed areas, billets and camps on the various fronts; pictures showed insect breeding places; diagrams illustrated sanitary appliances. Cases of specimens and coloured illustrations showed most of the important insect vectors of disease. Wooden and plaster models of incinerators, latrines, destructor centres, bath houses, etc., were shown, and all apparatus used for the purification and examination of water was demonstrated and actually used by the class. Models of disinfectors in common use, and other details connected with this work, were included.

Clothing and equipment for every front was shown, and three dummy figures, equipped for the East, the West and for the Murman coast, demonstrated the method of wearing the clothing issued.

In the food section, amongst other things, were exhibited measures for preventing beri-beri, germinating cereals, blown tins of various sorts, and hay boxes for trench or billet.

A room was devoted to tropical work, and included mosquito nets, mosquito-proof bivouacs and other appliances specially devised for the tropics.

In addition to the exhibits, files were kept in which were summarized all the orders, circulars and memoranda dealing with sanitary matters issued for the various fronts up to date.

The field exhibition was divided into three areas:—

(1) A Western area.

(2) An Eastern area.

(3) A trench area.

The Western Area.—This was divided into seven sections and, as far as possible, showed every type of sanitary appliance used on the Western front. Innumerable variations have been invented, types are constantly

"improved" or modified, but still the main principles remain. As far as possible the examples erected could be said to represent standard types upon which modifications could be based.

The first section of this area was devoted to *improvisation:* an example of how waste material could be used for sanitary work. A hut constructed entirely of waste tins contained apparatus of every kind—bunks, stoves, etc. —made from scrap material.

The second section exhibited a model cook-house with contents; field ovens, grease traps, etc.

The third section was devoted to water work and showed wells, water-cart, improvised chlorinators, etc.

The fourth section illustrated types of destructors from the simple turf incinerator to the Horsfall, covering all the main points in construction and management. Manure incinerators were also included.

The fifth section dealt with latrines and sewage disposal. Shallow trench latrines, deep pit latrines and receptacle latrines were shown, with examples of bad types. A model urine pit, with various types of trough, was included in this group. To cover the training for home camps, a complete drainage system was installed and a model sewage disposal scheme with sedimentation tanks and filters. "Herring-bone" and other systems for surface disposal were also shown.

The sixth section was devoted to disinfection and disinfestation and, included a dug-out hot-air chamber, Thresh disinfector, field sterilizing box. In association with this section a "Washington Lyon" was also demonstrated.

The seventh section was devoted to questions of ablution and sullage water disposal. A special tank for the treatment of sullage water with bleaching powder, lime or acid sodium sulphate was constructed. An improvised shower bath and system of disposal pits were also shown.

The Eastern Area was arranged in a similar manner but showed appliances specially applicable to Eastern conditions, clay ovens, cold storage chambers, a dug-out larder, Serbian barrels for disinfection, native latrines, etc.

The Trench Area was occupied by a small section of trenches, as seen on the Western front, which included a front line trench with pit latrines, receptacle latrines, dug-outs with rat-proof food safes, refuse receptacles, etc., also a communication trench and an abandoned side trench with refuse disposal area.

At the conclusion of the lectures and demonstrations the American officers were taken to a camp where they could see the various details of sanitary work actually carried out. There is of course no finality to such a scheme of visual training, but the above summary indicates the lines upon which such work may be undertaken. Demonstration

camps and centres have been much used during the war and their proven utility justifies a somewhat detailed description.

The other type of class dealt with at this school consisted of privates and non-commissioned officers destined for sanitary work at home and abroad.

A course of lectures was given on the theory and practice of sanitation in the field, with demonstrations of the various processes employed; these lectures followed the sequence of the medical officers' course, but were more elementary in theory and more detailed in practice. All details of construction of sanitary structures were taught practically and, in addition, every man received instruction in elementary brickwork, woodwork, metal work and drawing. Three days were devoted to each of these subjects and at the end of the course a written and practical examination was held. In addition to this examination, small *viva voce* classes were conducted each day at which notebooks were inspected, an excellent method of estimating the attention paid to lectures and demonstrations by each individual. The course had to be a very hurried one, but five or six weeks was sufficient time to give an intelligent man a grasp of the main essentials of the work.

The staff of the School consisted of one officer, a sanitary specialist who had served on the Western front; one serjeant, an expert builder and sanitary inspector; one corporal, an old soldier who was expert at metal work; one lance-corporal, a carpenter; and four privates, a builder, an architect, an artist and a clerk. In addition, there was a fatigue party which varied in number between eight and twelve.

In addition to the classes mentioned, men were trained so that they could form a nucleus for the establishment of similar schools, and special classes were held for various British officers who came to the school for instruction.

Of necessity the Leeds School could only be regarded as a temporary war time measure, and a more complete and permanent School of Hygiene was subsequently established at Blackpool, where for some time an excellent course on Field Sanitation and Tropical Medicine had been included in the training for Royal Army Medical Corps officers.

The Royal Army Medical Corps School of Hygiene, Blackpool.

This School was established in response to the urgent demand for specialized training in preventive work, more especially for medical officers selected for work in the tropics. The School is designed on ambitious lines so that all types of preventive work, both elementary and advanced, can be taught. Medical officers of all grades receive instruction in tropical medicine, both from a clinical and prophylactic point of view; they are also taught the general principles and practice of hygiene, including practical bacteriology and the analysis of food and water. Apparatus of all sorts is

demonstrated and there is an exhibition on similar lines to the one already described, but in a more advanced stage of evolution.

In addition to the classes for medical officers, there are others for privates and non-commissioned officers who are selected for special sanitary work. It is needless to enter into further details with regard to this Centre, which may be summarized as a school for teaching tropical medicine and hygiene, with special application to the demands of military life, and for special training in general army sanitation.

These three examples illustrate well certain stages in the development of sanitary education and emphasize the importance of practical training for men upon whose shoulders rests the burden of sanitary responsibility under the strained and uncivilized conditions incidental to warfare.

Special Training.

Specialization is the cry of the present age, and many branches of sanitation are specialties. The sanitary expert cannot be expected to be a specialist on every branch of work—engineering, water supplies, sewage disposal, dietetics, entomology, bacteriology, chemistry, statistics, etc.; very much less can the sanitary assistant or inspector be expected to accomplish such a feat. Men who will have specialized work to do need special training in that work, and the place for such training is not the general school of sanitation, it is some place where he can have individual personal experience of the work as actually carried out. A man may learn the whole theory of the chlorination of water by chlorine gas, he may study the regulating apparatus, and work through all the details of elaborate charts and diagrams, but it is only by actual experience with the water column that he can hope to be in a position to undertake definite responsibility. The same may be said with regard to specialization in mosquito work, surveys, drainage, and so forth. A certain amount may be learned by hearing lectures, examining dried specimens, looking at models and photographs, but it is only by definite training in field work, mosquito collection, mosquito breeding and general practical experience under a skilled entomologist that true efficiency is reached. The importance of this specialized education has been appreciated during the late war and an ever increasing effort has been made to satisfy the demand.

At Brentford, where so much ground has been broken with regard to chlorination on a large scale, men have received practical instruction in the work of a water column; here they have been able to follow the whole process and carry it out under the supervision of an officer whose experience in this branch of work may be said to be unique.

At Sandwich the War Office established an Entomological School, with every facility for carrying out such work. The locality was suitable for field collection and every appliance required for further research, such as breeding ponds, mosquito cages, constant temperature rooms, etc., was

supplied. Here officers and men have been able to familiarize themselves with all the up-to-date methods and requirements of such work under the supervision and instruction of a skilled entomologist.

In the Southern Command, where the work of incineration had reached a stage of perfection commensurate with the enthusiasm and skill of those in charge of the work, many men received an unrivalled practical experience in this branch of sanitation.

The central school can give detailed training in the duties appertaining to the water cart, the Clayton fumigator, the pressure disinfector; but such education cannot be regarded as complete until the pupil had studied the working of each appliance under the varied conditions of difficulty and high pressure which are encountered in actual practice.

In the wider field of sanitary administration, the specialist needs practical specific training for the special field of work for which he is chosen; and the need for such training, at first little realized, has been increasingly acknowledged, so that men of tried experience in civilian work have been given opportunities of seeing that work adapted to military requirements, before assuming posts of responsibility. This was not always recognized during the war and occasions have arisen when civilian Medical Officers of Health, ignorant of the practical application of their work to military conditions, have been placed in positions of authority even over the heads of men who have made a life-long study of military hygiene. Such anomalies are bound to lead to inefficiency and discontent and it is essential that every civilian Medical Officer of Health shall be fully instructed in the military application of his sanitary principles before he is placed in a position of authority in the field.

There are always certain centres where special work may best be seen and the details learned with the greatest rapidity; time given up to visiting such centres is well spent, in that it enables full use to be made of past experience; errors can be avoided and successful measures adopted. Such special visits form a very important link in the chain of sanitary education and much of the success attending this work has been the result of those in authority appreciating this fact.

Local Training.

After a man has completed his general training and, if necessary, his special training, he is in a position to be sent to the district where his ultimate work will be done. This district may be at home or abroad; if abroad, it might be in a Western war area, where conditions approximated closely to those at home, or it may be to an Eastern area, where an entirely new environment will be encountered. To fit him for work under such conditions, it is necessary for him to appreciate the difficulties with which he is likely to be faced, and the conveniences at hand for dealing with such difficulties. The nature of the country, the insect fauna, idiosyncrasies of

the natives, conditions of water supply, material available, difficulties of transport, and many other problems have to be inquired into. In the West, though the conditions approximate more closely to those at home than in the East, still there are details to be learned with regard to trench life in different areas, special orders, available material, etc., which make it advisable for those engaged on sanitary work to supplement the knowledge already obtained. In the East this is absolutely essential, and to satisfy this need demonstration centres were established at the various bases where all men and officers passing through could quickly learn of the special dangers to which they would be exposed and the various methods which had been found available and suitable to overcome such dangers.

In many places in the East such centres were established largely owing to the energy of a Sanitary Section Officer with special knowledge of educational methods; and through these centres medical officers, staff officers, combatant officers and privates passed on their way to the front and were taught how to avoid dangers which, without such foreknowledge, must have seriously diminished their fighting value. Here they were informed what material would be available for sanitary purposes and what would be unobtainable; here they could see how such material could best be used for sanitary purposes; here they could see the improvised apparatus at work, and study details of construction and management. Eight such schools were established in Egypt and Mesopotamia alone. Full sized working models were shown of every conceivable type of sanitary apparatus and demonstrations were given. It was essential to make such courses short and graphic, but the value of such demonstrations far exceeds the actual lessons learnt, in that they induce an adaptable temperament and an improvising mind. The rigid methods of peace time are unsuitable for active service, and at such centres the mind is massaged into elasticity.

The temple of health had to be built upon many foundations: the chalk of Flanders; the sand of Egypt; the alluvial deposits of Mesopotamia; the marshland of Macedonia; the clays of East Africa, and the limestone of Palestine. By local demonstration alone could the mind of the sanitarian be adapted to such diversity of work.

In France also these local schools and demonstration centres were no less prominent. One amongst many, a school started in the winter of 1916, at St. Pol, will serve as a type. In 1917, an officer from the 2nd London Sanitary Company was appointed commandant, and the School was developed on progressive lines. Models and sanitary appliances of all sorts were installed, and lectures and demonstrations given daily. The teaching staff consisted of the D.A.D.M.S. (San.), the officer commanding a mobile hygiene laboratory, the officer commanding a sanitary section, the officer commanding a mobile bacteriological laboratory, and the commandant, assisted by four non-commissioned officers from a sanitary section which had had considerable experience of front line work.

The courses were as follows:—

For non-commissioned officers and men: Construction of sanitary appliances, five days (Class of 25). Sanitation of front areas, camps and billets, five days (Class of 25). Water duties, two and a half days (Class of 15). These courses ran concurrently, and the men were housed and rationed by the School, thus obtaining a practical lesson in living under ideal sanitary conditions.

The teaching was conducted on classical lines. Construction classes were taught to make and improvise latrines, urinals, grease traps, meat safes, ablution benches, field ovens, etc. The sanitary classes were instructed in general sanitary duties and maintenance, including the digging of latrines and urine pits, soakage pits and surface water drains; also disinfection in all its branches, cook-house cleanliness, supervision of food, fat saving, the disposal of refuse and maintenance of sanitary conditions. The water class was instructed in general water duty, the Horrocks test, the poison test, boiling, filtration, etc., and in the care of the water cart and the use of the Service clarifier.

All classes also received lectures on personal hygiene, and were bathed and, when necessary, deloused. At the close of each course a short examination was held and certificates of proficiency given where merited.

Two courses a week were open to officers:—

(1) A three-day course for medical officers.

(2) A three-day course for regimental officers.

These courses included lectures upon the duties of officers in the field with regard to sanitary matters, lectures on water supplies and purification, disinfection and field sanitation in general, with practical demonstrations of methods of construction and management.

Special courses were also given for American troops, for Indian labour units and the few Siamese troops on this front.

The School consisted of an indoor and outdoor exhibit, and working models of practically every type of sanitary appliance were shown. In addition there was a small reference library.

Practically everything was improvised, an impressive object lesson for men who knew they would be called upon to carry out their sanitary work with a very inadequate supply of orthodox material.

By means of such a school, the fundamental lessons learnt at home receive their applications to special conditions, and a uniform standard of sanitation is provided for each district.

Revision Courses in the Field.

For many reasons it is important that sanitary teaching shall be carried further forward than the base. In the front line settled conditions give place to an ebb and flow, which menaces all hope of continuity; men are killed or invalided to the base, they are replaced from other less essential

branches or from drafts hurriedly supplied. Intelligent military men in a battalion are replaced by incompetents or weaklings, and water duty men are utilized for other work. This is undoubtedly a bad policy, but necessity is a stern task-master and frequently, during hard fighting, the military need seems to dwarf all sanitary requirements.

Revision work can conveniently be carried on behind the front line during periods of rest. Classes are arranged at various centres, and all sanitary or water duty men are ordered to attend. By this means it is possible for the D.A.D.M.S. of a division to keep in touch with those directly responsible for executive sanitation, and to have some check upon the continuity of battalion personnel. At these classes all sanitary matters are reviewed practically, and with an eye to special local conditions. Separate classes are held for water duty men and sanitary personnel, and the former are specially instructed in the care and use of the water-cart and the performance of the Horrocks test. These revision classes are also valuable in encouraging the men in their work; there is a tendency for the combatant to look down upon all sanitary work, and it is easy for a keen lecturer to stimulate enthusiasm.

Special classes may also be held to meet any special emergency which may arise. As an example may be cited a water class held in a barn, before one of the great British offensives, to instruct the water duty men of the division in an improvised system of chlorination for tanks placed in the trenches to meet any emergency during the attack and preliminary bombardment.

Revision classes for officers are equally important, and these were frequently held in temporary schools in close proximity to the line. The value of models, however small and crude, can scarcely be overestimated; many of the revision classes owed much of their success to the fact that all important points were illustrated by small hand models, which could be easily transported from centre to centre.

The commanding officers of battalions were not, of course, included in such classes, but it is extremely important that they shall be kept in touch with new methods, and occasionally reminded of their sanitary responsibilities. To meet this need, an experiment was tried, which is certainly worthy of considerable extension. Under divisional orders the commanding officers attended a lecture, or, perhaps, it might more suitably be termed a conference, where a short dissertation was given on preventive work in as far as it specially affected them. At the end of the lecture there was a discussion upon the various difficulties which present themselves with regard to the work.

Propaganda Work.

There is undoubted scope for propaganda work of a popular type with regard to measures for the preservation of health. Popular lectures and posters are invaluable; whatever system is adopted must make a strong

appeal to the imagination. Picture post-cards, posters, and leaflets have been freely used to impress the soldier with regard to the danger of flies, mosquitoes, and other insects, also in order to impress upon him the need for strict obedience in carrying out orders with regard to sanitation, quinine prophylaxis, etc. It is possible to command obedience, but it is easier with intelligent men to enlist active co-operation by appealing to their common sense. A certain degree of "abandon" in this branch of teaching is an excellent thing; a louse of normal dimensions may be sufficient to tickle a scientist, but, to impress the unreflecting, it should be painted in lurid colours, and of gigantic proportions. An accurately posed anopheles may be a scientific lesson, but, by the side of some of the French malaria propaganda posters, it fails lamentably to impress. In the same way popular lectures must be delivered by some one who can hold his audience, and even the fact that a man is a Fellow of the Royal Society does not guarântee this quality.

Discipline.

The best lesson of all in sanitary matters is the practical lesson of daily experience. Too much stress cannot be laid upon the value of example and strict discipline, so that the men automatically carry out the precepts they have been taught. It is quite possible to possess a very advanced theoretical knowledge of sanitation, and yet be most insanitary. The cynic has said, not without reason, "If you want bad ventilation, go to a lecture on hygiene or to a health office"; on many occasions, the billets occupied by sanitary personnel have been found defective in sanitary details of cleanliness and order. It is hopeless for an orderly officer to expect the company's cook-house to be properly managed if the cook-house of the officers' mess is neglected. The commanding officer, adjutant, and orderly officer must emphasize the importance attaching to sanitation by practice as well as by precept; by a strict attention to detail; so that from constant repetition, habits of cleanliness, etc., become habitual to the troops under their command. It is only by the establishment of a sanitary conscience in the unit that danger can be avoided at times when the mind is distracted by more pressing matters. To maintain this high standard under acute service conditions, routine inspections by men specially trained for this purpose are of great value.

Education is the foundation stone upon which the whole system of preventive medicine is based; but to have full value such education must be interpreted in its broadest sense, remembering that education does not end with the teaching of class or lecture room, but covers the whole range of human experience.

ON THE RESULTS OBTAINED BY THE WEIL-FELIX REACTION FOR TYPHUS FEVER AT THE GARRISON OF BAKU DURING THE PERIOD MARCH-JULY, 1919, INCLUSIVE.[1]

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CONTENTS.

Introduction.

The series consists of 32 cases of typhus fever examined during the acute stage of the disease; 20 cases examined during convalescence from typhus fever; and 21 cases of diseases other than typhus fever in which the temperature was raised and in 12 of which the patient showed signs and symptoms such that the clinician wished typhus fever to be excluded.

Cases of typhus fever (acute)	32	
Cases of typhus fever (convalescent) ..	20	
	—	52
Cases of diseases other than typhus fever		21
		—
	Total	73

The number of "control" cases, that is of cases of disease other than typhus fever, namely, 21 cases, is small. This is because no attempt was made to collect blood as a routine from such cases, it being understood that this aspect of the question was being worked up in other laboratories in the Force. But it would seem of value to record the findings in these

[1] This paper was submitted as a Report to Colonel C. M. Wenyon, C.M.G., etc., A.M.S., Consulting Bacteriologist, Army of Black Sea. We wish to record here our appreciation of and gratitude for the stimulus and invaluable help received from Colonel Wenyon in all our work during the time we served under him in the Army of the Black Sea.

twenty-one cases investigated by us. The reaction was carried out in thirteen other cases, but except that these were certainly not cases of typhus fever, a definite diagnosis as to the condition could not be given from the clinical and laboratory data obtained. These thirteen cases are not included, therefore, in this report.

The cases examined during the acute stage of typhus fever and some of the cases examined during convalescence were under the charge of Major Glynn, R.A.M.C., 40th Field Ambulance, Baku. The remaining cases were patients admitted to 25th Casualty Clearing Station Hospital, Baku, and six cases of malaria investigated at the Military Detention Hospital) Detachment 40th Field Ambulance) at Petrovsk.

It is understood that Major Glynn, R.A.M.C., is preparing a report dealing with the clinical aspect of those cases which were under his charge at 40th Field Ambulance, and correlating the clinical conditions and findings with the results given by the Weil-Felix Reaction.

We wish to acknowledge our indebtedness to the Senior Medical Officer, Baku, for supplying the chart showing the case incidence of typhus fever among the troops comprising the garrison at Baku during the period covered by this Report; also to Major Glynn, R.A.M.C., and the other divisional and medical officers who were in charge of the cases comprising the series for giving us every facility and help in carrying out our investigations.

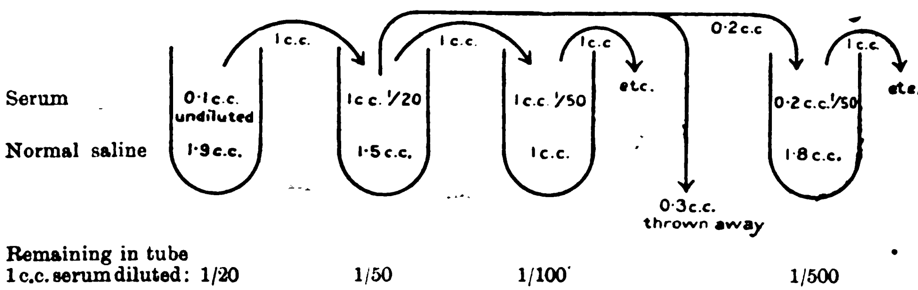
Technique.

The technique employed in carrying out the reaction was the same as that used for all our agglutination tests. The test was performed in test tubes of ordinary size (6 inches by $\frac{5}{8}$ inches). Each tube contained one cubic centimetre of serum of the dilution required and each batch of tests was controlled by normal serum in dilutions 1/20, 1/50, 1/100 and by a tube containing one cubic centimetre normal saline (NaCl 0·85 per cent).

A young culture, about twenty-four hours old, of *Bacillus proteus vulgaris*, "strain ×19," on an agar slope was emulsified in 0·5 cubic centimetre to 0·75 cubic centimetre normal saline, the amount of saline depending upon the luxuriance of the growth. (During the course of these experiments and as a routine, an agar slope of *B. proteus vulgaris*, ×19, was put up each day in order to keep the strain "acclimatized" to artificial media.) Of the emulsion, two drops were added to each tube, the drops being of such size as to give a distinct milkiness to the contents of the tube. The tubes were then incubated at 37° C. for two hours. At the end of this time, the results were noted and the tubes placed aside at room temperature until the following day when the final results were read.[1]

[1] Weil and Felix recommend that the results be read seventeen hours after the tubes have been removed from the incubator. In a number of experiments the findings after seventeen hours, twenty-four hours, thirty-six hours, and forty-eight hours were compared. In all the cases, the findings remained the same.

Experiments showed that the agglutination titre of an undiluted serum for *B. proteus vulgaris*, X19, remained the same for at least three to four days. Our practice, in view of this, was to test the agglutination of the serum in dilutions 1/20, 1/50, 1/100, 1/200 and thus be able to give a diagnosis positive or otherwise. If the titre of the serum had not been determined by these dilutions, on the following day, dilutions of 1/200, 1/400, 1/500, 1/800, 1/1,000, 1/2,000 were put up. If necessary, on the third day, further dilutions and namely 1/2,000, 1/4,000, 1/5,000, 1/8,000, 1/10,000 were tested. Our method of obtaining one cubic centimetre serum in these dilutions is shown in the following scheme :—



In reading the results, agglutination in dilution of 1/100 was taken as indicating a positive reaction.

Reaction of *Bacillus proteus vulgaris*, X19, with Normal Serum and with Normal Saline Solution.

As stated in the preceding paragraph, with each batch of sera to be tested two controls were put up, namely, one of normal serum in dilutions 1/20, 1/50, 1/100, and the other with normal saline solution. These controls were put up on forty different occasions.

On 37 out of the 40 occasions, the author's blood serum was used in the control, and on the remaining 3 occasions, blood serum which had been taken for other purposes and from healthy individuals was used.

Of the 40 controls, with the normal serum in dilution 1/20, 13 gave no agglutination, 17 gave a trace of agglutination, 7 gave slight agglutination, and 2 gave marked agglutination. With the serum in dilutions 1/50, 1/100 agglutination was never observed.

Of the forty controls with normal saline solution, agglutination (so-called "auto-agglutination") was never observed.

I.—Cases of Typhus Fever, Acute, Thirty-two Cases.

The results obtained in examining fifty-seven specimens of blood serum from thirty-two cases of typhus fever in which the first test was made during the acute stage of the disease are shown in the following table :—

TABLE I.

Day of disease	Number of specimens examined	Result		1st Test		2nd Test	
		Positive	Negative	Positive	Negative	Positive	Negative
2nd	1	..	1	..	1	..	..
3rd	1	1	..	1	..	..	..
4th	2	1	1	1	1	..	..
5th	6	4	2	4	2	..	..
6th	10	7	3	7	3	..	..
7th	4	3	1	3	1	..	..
8th	3	3	..	1	..	2	..
9th	1	1	..	..	..	1	..
10th	7	7	..	1	..	6	..
11th	8	8	..	1	..	7	..
12th	3	3	..	2	..	1	..
13th	4	4	..	3	..	1	..
14th	3	3	..	..	..	3	..
15th	1	1	..	..	..	1	..
16th	1	1	..	..	..	1	..
18th	1	1	..	..	..	1	..
19th	1	1	..	..	..	1	..

It would appear from the above that the time when the result of the reaction is desired mostly by the clinician is on the fifth, sixth or seventh day of the disease, although in many of the cases in which the blood was tested for the first time on these days (6, 10 and 4 cases respectively) the diagnosis of typhus fever was almost certain from the clinical signs and symptoms.

During the second to seventh days inclusive of the disease, the blood of 24 patients was examined; of these, 16 cases (66·7 per cent) were positive, and 8 cases (33·3 per cent) were negative.

From the eighth to nineteenth days inclusive of the disease, the blood of 8 patients was examined for the first time, and the blood of 25 patients was examined for the second time; in all these 33 cases the test was positive (100 per cent).

In the eight cases in which the first examination of the blood was made during the second to seventh days inclusive of the disease and with negative results, the second test gave positive findings. These cases are shown in detail in Table II (p. 29).

Two cases were tested on the third and fourth days respectively of the disease and with positive results:—

Case No. 2, *Mo.* (*Indian*), third day of disease, titre 1/200; *Case No.* 3, *S.* (*British*), fourth day of disease, titre 1/800.

There would arise naturally some doubt as to whether the blood of these patients was taken as early in the disease as stated and especially so in the case of the Indian. *Case No.* 2, *Mo.*, was a dhobi (washerman) at the 25th Casualty Clearing Station Hospital, Baku; he reported sick on March 18, 1919, and stated that on the previous day he had felt perfectly well and fit for his work. Inquiries made among the other

dhobis working in the same building confirmed the patient's statement. On the day prior to his reporting sick he had not complained to them of feeling unfit in any way and he had carried out his usual duties. On March 20, 1919, typhus fever was suspected and blood was taken for the Weil-Felix Reaction. It would appear, therefore, that the day on which the blood was taken was without doubt the third day of the disease.

Case No. 3, *S.*, was a sapper in the Royal Engineers. Careful inquiries could not elicit that he had felt unfit in any way prior to March 10, 1919. The blood was taken on March 13, 1919.

The following Table II and Table III have been compiled to show the agglutination titres of the sera of the thirty-two cases of typhus fever :—

TABLE II. — Eight Cases in which First Test was Negative and Second Test was Positive.

Case No.	1st test		2nd test	
	Day of disease	Titre of serum	Day of disease	Titre of serum
1. Wi...	2nd	0	13th	1/1,000
4. Cl.	4th	1/20	10th	1/800
5. Ed.	5th	1/20	10th	1/2,000
6. Ev.	5th	1/20	10th	1/2,000
11. Li.	6th	1/20	11th	1/4,000
17. Pe.	6th	1/50	10th	1/800
18. A.	6th	0	11th	1/200
21. K.	7th	1/50	12th	1/1,000

TABLE III.—Twenty-four Cases in which both First Test and Second Test (when done) were Positive.

Case No.	1st test		2nd test	
	Day of disease	Titre of serum	Day of disease	Titre of serum
2. M.	3rd	1/200	8th	1/1,000
3. S.	4th	1/800	8th	1/1,000
7. Gr.	5th	1/1,000	11th	1/1,000
8. Gl.	5th	1/100	9th	1/500
9. Z.	5th	1/100	..	..
10. Pu.	5th	1/400	14th	1/2,000
12. Lo.	6th	1/200	11th	1/4,000
13. Mo...	6th	1/100	11th	1/2,000
14. T.	6th	1/200	10th	1/2,000
15. Pr.	6th	1/200	10th	1/1,000
16. H.	6th	1/400	11th	1/800
19. Bi.	6th	1/500	14th	1/4,000
20. W.	6th	1/100	15th	1/1,000
22. I.	7th	1/200	11th	1/800
23. M.	7th	1/2,000	18th	1/800
24. Do.	7th	1/8,000	14th	1/1,000
25. N. S.	8th	1/4,000	19th	1/2,000
26. F. K.	10th	1/200	—	—
27. Ha...	11th	1/4,000	—	—
28. Sau.	12th	1/8,000	—	—
29. Ud. Si.	12th	1/200	16th	1/800
30. Pi.	13th	1/4,000	—	—
31. Wa.	13th	1/500	—	—
32. Ma...	13th	1/2,000	—	—

From Tables II and III it will be seen that two tests were made in twenty-five out of the thirty-two cases of typhus fever. Of these 25 cases, during the interval between the first and second tests, the agglutinin contents of the patient's serum as shown by its agglutinating power had fallen in 3 cases (Cases 23, 24, 25); had remained the same in 1 case (Case 7); had risen in 21 cases.

A comparison of the agglutinin contents of the sera, as shown by its agglutinating power, at the stages of the disease when tests were made is shown by the following table compiled from the fifty-seven specimens from the thirty-two cases of typhus fever:—

TABLE IV.

Day of disease	Number of specimens											
	Titre of serum:											
	Under 1/20	1/20	1/50	1/100	1/200	1/400	1/500	1/800	1/1,000	1/2,000	1/4,000	1/8,000
2nd ..	1	..	..	..	1	..	..	..	..	..	..	..
3rd ..	..	..	..	..	..	..	..	1	..	..	..	..
4th ..	..	1	..	..	..	..	..	1	..	..	..	..
5th ..	..	2	..	2	..	1	..	..	1	..	..	..
6th ..	1	1	1	2	3	1	1	..	..	..	..	..
7th ..	..	..	1	..	1	..	..	..	..	1	..	1
8th ..	..	..	..	..	..	..	1	..	2	..	1	..
9th ..	..	..	..	..	..	..	..	..	..	..	..	..
10th ..	..	..	..	..	1	..	..	1	1	3	..	..
11th ..	..	..	..	..	1	..	..	2	1	1	3	..
12th ..	..	..	..	..	1	..	..	..	1	..	..	1
13th ..	..	..	..	..	..	..	1	..	1	1	1	..
14th ..	..	..	..	..	..	..	..	..	1	1	1	..
15th ..	..	..	..	..	..	..	..	..	1	..	..	..
16th ..	..	..	..	..	..	..	..	1	..	..	..	..
18th ..	..	..	..	..	..	..	..	1	..	..	..	..
19th ..	..	..	..	..	..	..	..	...	..	1	..	..

Of the thirty-two cases of typhus fever six cases died. The following table shows the titres of the sera of these cases:—

TABLE V.

Case No.	1st test		2nd test		Day after onset of disease on which death occurred
	Day of disease	Titre of serum	Day of disease	Titre of serum	
3. S.	4th	1/800	8th	1/1,000	12th
6. Ev.	5th	1/20	10th	1/2,000	16th
9. Z.	5th	1/100	—	—	8th
10. Pu.	5th	1/400	14th	1/200	14th
30. Pi.	13th	1/4,000	—	—	21st
31. Wa.	13th	1/500	—	—	21st

Of these fatal cases, four died as a direct result of typhus fever, namely, Cases 3, 9, 10 and 31.

Case No. 6, *Ev.*, was making good progress when he had an apparent relapse and died on March 18, 1919, sixteen days after onset of typhus fever. Death was due to hæmorrhagic pneumonia occurring in the course of the typhus fever.

Case No. 30, *Pi.*, developed inflammation of the glands in the neck; these broke down forming abscesses. The patient died on March 18, 1919, twenty-one days after the onset of typhus fever, as the result of the septic absorption during his weakened condition.

Case No. 10, *Pu.* Specimens of the blood serum, fluid from pericardial sac, and cerebrospinal fluid were taken at the autopsy held seventeen hours after death and fourteen days after the commencement of the disease. A comparison of the agglutination titres of each fluid was made with the following results :—

Dilutions		1/20	1/50	1/100	1/200	1/400	1/500	1/800	1/1,000	1/2,000	NaCl
Patient's	Blood serum	++++	++++	++++	++++	++++	++++	+++	++	+	
	Pericardial fluid	++++	++++	++++	++++	+++	+++	++	+	trace	0
	Cerebro-spinal fluid	++++	+++	++	trace	0	0	0	0	0	
Normal blood serum ..		trace	0	..	..	..	..	..	..	..	..

++++ = complete agglutination and precipitation.
0 = no agglutination or precipitation.

As this was the last of the fatal cases of typhus fever further investigations along these lines could not be carried out.

Case No. 32, *Ma.* The following case would seem of great interest as showing the value of the Weil-Felix reaction in typhus fever.

44635 Driver Ma., 35th Mule Corps, was admitted to 25th Casualty Clearing Station Hospital, Baku, with high temperature. The question of typhus fever arose, and on March 28, 1919, the sixth day after the onset of the illness, a specimen of the blood was taken for the Weil-Felix Reaction. In dilution of 1/20 the serum gave a trace of agglutination and no agglutination was obtained in dilutions of 1/50, 1/100, 1/200. The control with normal serum on this day gave the same results. The patient was transferred, however, to 40th Field Ambulance, Baku, as a possible case of typhus fever. After transfer, the diagnosis of malaria was made and *Plasmodium vivax* was found in films of the peripheral blood. In order to complete our routine a second Weil-Felix test was made on April 8, 1919, seventeen days after the onset of malaria, with the same results as regards the patient's serum and normal serum as were given by the first test.

After running a course for some time, typical of malaria, other clinical

signs and symptoms arose which caused Major Glynn, R.A.M.C., to think that since admission to 40th Field Ambulance the patient had developed typhus fever. On April 19, 1919, the blood was taken again and tested for the Weil-Felix Reaction. The serum gave an agglutination titre of 1/2,000. So far as could be ascertained from the clinical data, April 19, 1919, was the thirteenth day of the patient having typhus fever.

The findings are tabulated as follows:—

Date of taking blood	Day of typhus fever	Dilution of patient's serum									Dilution of normal serum		NaCl
		1/20	1/50	1/100	1/200	1/400	1/500	1/800	1/1,000	1/2,000	1/20	1/50	
28.3.19	—	trace	0	0	..	..	..	0	..	..	trace	0	0
8.4.19	2nd	trace	0	0	..	..	..	0	..	..	trace	0	0
19.4.19	13th	++++	++++	++++	++++	++++	++++	++++	++	trace	+	0	0

++++ = complete agglutination and precipitation.
0 = no agglutination or precipitation.

II.—Cases of Typhus Fever, Convalescent,—Twenty Cases.

These may be divided into two groups, namely:—

(*a*)	Patients still in hospital	12 cases
(*b*)	Patients returning to United Kingdom	8 ,,
	Total	20 cases

(*a*) *Patients still in Hospital—Twelve Cases.*

The blood was taken on dates varying from the twentieth to the thirtieth day after onset of the disease. In all cases the results of the Weil-Felix Reaction were positive.

The agglutination titre was	1/500	in 1 case
	1/1,000	,, 3 cases
	1/2,000	,, 6 ,,
	1/8,000	,, 1 case
	1/10,000	,, 1 ,,
Total		12 cases

These results are shown in the following table:—

TABLE VI.

Case No.	Day after onset of disease	Titre of serum	Case No.	Day after onset of disease	Titre of serum
33. J.	20th	1/2,000	39. Hu. ..	26th	1/500
34. C.	21st	1/2,000	40. Gil. ..	27th	1/2,000
35. E.	21st	1/8,000	41. T... ..	27th	1/2,000
36. Mo. ..	22nd	1/1,000	42. Sl. ..	29th	1/2,000
37. La. ..	24th	1/1,000	43. Wi. ..	30th	1/2,000
38. Er. ..	25th	1/10,000	44. Ba. ..	35th	1/2,000

(b) Patients returning to United Kingdom—Eight Cases.

These patients had had typhus fever in Persia and were being evacuated to the United Kingdom by way of Baku. The blood was taken on dates varying from the forty-third day (six weeks one day) to the one hundred and twenty-fourth day (seventeen weeks five days) after onset of the disease.

Six of the cases gave positive findings; the remaining two cases gave negative findings (titre 1/50).

The agglutination titres were	1/50	in 2 cases
	1/100	,, 1 case
	1/200	,, 2 cases
	1/400	,, 3 ,,
Total		8 cases

The results are shown in the following table:—

TABLE VII.

Case No.	Day after onset of disease	Titre of serum	Case No.	Day after onset of disease	Titre of serum
45. Ca. ..	43rd	1/400	49. B... ..	83rd	1/200
46. H... ..	58th	1/200	50. Tu. ..	86th	1/100
47. Ju. ..	67th	1/400	51. Bl. ..	112th	1/50
48. W... ..	81st	1/50	52. De. ..	124th	1/400

The above results would indicate that the reaction persists for varying times after the onset of the disease; whereas in one case the result after eighty-one days was negative, a positive result was obtained in another case after one hundred and twenty-four days. Moreover, in these eight cases it will be noticed that there was no relationship between the length of time after onset of the disease and the agglutination titres of the different sera. But when compared with the titres of the twelve cases still in hospital (Table VI) and whose blood was taken between the twentieth and thirty-fifth days after onset, the present series shows, with one exception, viz., Case 39 Hu, a very marked lowering of the agglutination titre.

III.—Cases of Diseases other than Typhus Fever—Twenty-one Cases.

This series of cases consisted of:—

Malaria	*Plasmodium falciparum*	2	
	Plasmodium vivax primary	5	
	relapse	6	
		—	13 cases
Enteric fever			3 ,,
Acute apical pneumonia..			1 case
Relapsing fever			1 ,,
Acute epidemic jaundice			1 ,,
Pulmonary tuberculosis and carcinoma			1 ,,
Pleural effusion			1 ,,
Total			21 cases

The clinical diagnosis of these cases was confirmed by laboratory findings, by autopsy, or by operation (case of pleural effusion).

In dilution of the serum of 1/20 no agglutination was obtained in 7 cases, a trace of agglutination in 11 cases, slight agglutination in 2 cases, and distinct agglutination in 1 case. In dilution of the serum of 1/50, a trace of agglutination was obtained in 1 case only.

Details of the cases are given in the following table :—

TABLE VIII.

Case No.	Diagnosis	Day of disease	Dilution of serum 1/20	1/50	1/100
53. Su. ..	Malaria—M.T.	9th	0	0	0
54. B... ..	,, M.T.	14th	trace	0	0
55. M... ..	,, B.T.	2nd	0	0	0
56. Ar. ..	,, B.T.	3rd	trace	0	0
57. An. ..	,, B.T.	3th	trace	0	0
58. Pe. ..	,, B.T.	5th	0	0	0
59. Ma. ..	,, B.T.	6th	trace	0	0
60. Re. ..	,, B.T.	6th	+	0	0
61. Ro. ..	,, B.T.	7th	trace	0	0
62. W... ..	,, B.T.	8th	trace	0	0
63. Li... ..	,, B.T.	8th	0	0	0
64. Ga. ..	,, B.T.	10th	trace	0	0
65. K. I. ..	,, B.T.	36th	trace	0	0
66. V... ..	Enteric fever	6th	trace	0	0
67. W. St. ..	,, ,, ...	10th	0	0	0
		17th	0	0	0
68. Br. ..	,, ,, ...	24th	0	0	0
69. Wt. ..	Acute apical pneumonia ..	6th	++	trace	0
70. D... ..	Relapsing fever	8th	+	0	0
71. Ni. Si. ..	Acute epidemic jaundice ..	7th	trace	0	0
72. Pa. Si. ..	Carcinoma, pulmonary tuberculosis	17th day of symptoms	traee	0	0
73. L. St. ..	Pleural effusion	4th	0	0	0

Full details of the results of the Weil-Felix Reaction in all the cases investigated are given in Appendices II, III and IV of this Report.

CONCLUSIONS.

From this series of investigations it may be concluded that :—

(1) Agglutination obtained by serum in dilution 1/100 indicates typhus fever.

(2) After about the eighth day from onset of the disease, if no agglutination is given by the serum in dilution 1/100, acute typhus fever is excluded.

(3) A positive reaction is given by the serum for a varying number of weeks after an attack of typhus fever. There is no relationship in different cases between the time after the attack and the agglutination titre of the serum.

But in drawing these conclusions it must be understood that we do not wish to dogmatize. To be able to do so, an investigation of a larger series of cases would have been necessary.

SUMMARY.

(1) The series consisted of 73 cases; of these, 32 were cases of acute typhus fever, 20 were cases convalescent from typhus fever, and 21 were cases of diseases other than typhus fever.

(2) With controls on forty different occasions with normal serum in dilution 1/20 no agglutination was obtained on 13, a trace of agglutination on 17, slight agglutination on 7, and marked agglutination on 2. With normal serum in dilution 1/50, no agglutination was ever obtained.

(3) With controls on forty different occasions with normal saline solution, agglutination ("auto-agglutination") was never obtained.

(4) During the first seven days after onset of typhus fever, the sera of 24 patients were tested; 16 cases (66·7 per cent) were positive, and 8 cases (33·3 per cent) were negative. The 8 negative cases gave a positive finding by the second test carried out on the tenth to thirteenth days inclusive.

(5) From the eighth to the nineteenth days inclusive of the disease, the sera of 8 patients were examined for the first time, and the sera of 25 patients were examined for the second time; positive results were obtained in all 33 cases (100 per cent).

(6) In 25 out of 32 cases of acute typhus fever, two tests were made; during the interval between the first and second tests, the agglutination titre of the serum had fallen in 3 cases (12 per cent), and remained the same in 1 case (4 per cent), and had risen in 21 cases (84 per cent).

(7) In 25 out of 32 cases of acute typhus fever in which two tests were made, the highest agglutination titre obtained was 1/200, 1 case; 1/500, 1 case; 1/800, 5 cases; 1/1,000, 7 cases; 1/2,000, 6 cases; 1/4,000, 4 cases; 1/8,000, 1 case.

(8) In 12 patients convalescent from typhus fever, the sera obtained on dates varying from the twentieth to the thirtieth day after onset of the disease gave agglutination titres of 1/500 to 1/10,000.

(9) In 8 patients convalescent from typhus fever the sera obtained on dates varying from the forty-third to the one hundred and twenty-fourth day after onset of the disease gave negative results (1/50) in 2 cases, and in 6 cases agglutination titres of 1/100 to 1/400.

(10) In 21 cases of patients suffering from diseases other than typhus fever, the serum in dilution 1/50 gave a trace of agglutination in 1 case only; in no case was agglutination obtained in dilution of serum of 1/100.

(11) From this series of cases it would appear that agglutination obtained by serum diluted 1/100 indicates typhus fever; a negative result with dilution of serum 1/100 after about the eighth day after onset of the disease excludes acute typhus fever; a positive reaction is given by the serum for a varying time after the onset of the disease; in 2 cases it was negative on the eighty-first and one hundred and twelfth day respectively, and in 6 cases it was positive on dates varying from the forty-third to the one hundred and twenty-fourth day.

APPENDIX IV.

Details of Results of the Weil-Felix Reaction in Cases of Diseases other than Typhus Fever.

Case No.	Regtl. No.	Rank	Name	Unit	Date of taking blood	Day of disease	Dilution of patient's serum 1/20	1/50	1/100	1/200	Dilution of normal serum 1/20	1/50	1/100	NaCl	Diagnosis	Remarks
53	14190	Lce. (Actg. Cpl.)	R. S. ..	R.A.F. ..	27.7.17	9th	0	0	0	0	0	0	0	0	Malaria—M.T. ..	Primary; gametocytes; schizonts
54	206860	Cpl. ..	W. H. B.	,, ...	27.7.19	14th	Trace	0	0	0	0	0	0	0	,, M.T...	Primary; rings; gametocytes
55	—	2nd Lt.	J. MacI.	,, ...	27.7.19	2nd	0	0	0	0	0	0	0	0	,, B.T...	Primary; amœboid forms; schizonts; gametocytes
56	—	Interp.	A. A. ..	40th Fld. Am.	24.5.19	3rd	Trace	0	0	0	0	0	0	0	,, B.T...	Relapse
57	218492	Actg. Cpl.	An. ..	R.A.F. ..	27.7.19	3rd	0	0	0	0	0	0	0	0	,, B.T...	Primary
58	—	Capt. ..	T. E. C. P.	,, ...	27.7.19	5th	0	0	0	0	0	0	0	0	,, B.T...	Primary; rings; amœboid forms
59	44635	Dvr. ..	Ma. ..	35th Mule Corps	28.3.19	6th	Trace	0	0	0	Trace	0	0	0	,, B.T...	Relapse
60	—	Lieut. ..	J. F. R.	9th Worcs. ..	21.4.19	6th	+	0	0	0	+	0	0	0	,, B.T...	,,
61	60023	Pte. ..	W. Ro...	7th N. Staffs. ..	29.3.19	7th	Trace	0	0	0	Trace	0	0	0	,, B.T...	,,
62	106422	,, ..	Wr. ..	R.A.M.C. ..	21.3.19	8th	,,	0	0	0	,,	0	0	0	,, B.T...	,,
63	192767	Actg. Cpl.	R. Li. ..	R.A.F. ..	27.7.19	8th	0	0	0	0	0	0	0	0	,, B.T...	Primary; amœboid forms; schizonts
64	—	Capt. ..	Ga. ..	,, ...	23.7.19	10th	Trace	0	0	0	0	0	0	0	,, B.T...	Primary; amœboid forms
65	4615	Sepoy ..	Kh. Is...	72nd Punjabis	31.3.19	36th	,,	0	0	0	0	0	0	0	,, B.T...	Relapse
66	505	Pte. ..	V. ..	Maltese Labour Corps	3.7.19	6th	,,	0	0	0	Trace	0	0	0	Enteric fever ..	*Bacillus typhosus* isolated from blood
67	18386	,, ..	W. St. ..	R.M.L.I.	20.3.19	10th	,,	0	0	0	,,	0	0	0	,, ,, ..	*B. typhosus* isolated from stool
					27.3.19	17th	0	0	0	0	0	0	0	0		
68	—	Stoker ..	Br. ..	R.N.	21.3.19	24th	0	0	0	0	Trace	0	0	0	,, ,, ..	*B. typhosus* isolated from stool
69	—	Pte. ..	F. W. ..	7th Glos. ..	21.4.19	6th	++	Trace	0	0	+	0	0	0	R. apical pneumonia—acute	—
70	657579	Sepoy ..	R. D. ..	..	19.6.19	8th	+	0	0	0	Trace	0	0	0	Relapsing fever	*Spirochæta recurrentis* in blood
71	2946	,, ..	S. N. ..	19th Punjabis	5.4.19	7th	Trace	0	0	0	0	0	0	0	Acute epidemic jaundice	Autopsy April 5, 1919
72	4426	Rfm. ..	Si. P. ..	2/4th Gurkhas	29.3.19	17th day of symptoms	,,	0	0	0	Trace	0	0	0	Malignant disease	,, May 12, 1919
73	15318	Pte. ..	L. St. ..	R.M.L.I. ..	20.3.19	10th	,,	0	0	0	,,	0	0	0	Pleural effusion	—

…um	
1/1,000	1/2,000
+	0
+	0
Trace	0
0	0
++	++
++	++
+	0
0	0
..	..
++	+
++++	++
++++	++
+++	+
++++	++
Trace	0
0	0
0	0
..	..
+++	+
+	0
Trace	0
0	0
0	0
+	0
+++	+
..	
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THE TREATMENT OF MUSCULAR ATROPHY BY ARTIFICIAL STIMULATION.[1]

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Practically every wound has resulted in an injury of some degree to one or more muscle groups, and long after inflammation has subsided and healing has taken place, there remains a disability and loss of function in the affected limb which is to a very large extent due to pathological changes in the muscles. The treatment of such cases is generally handed over to the department of physio-therapy for treatment by massage and electricity, and too often such treatment is apt to be carried out in a mechanical and irrational manner and without proper knowledge of the rationale of the methods to be adopted for the restoration of the muscle to its normal condition and function.

The injuries sustained by such muscles may be classified according to their ætiology under two heads (*a* and *b*) :—

(*a*) (1) Injury of the muscle due to direct trauma ; (2) Injury due to the action of toxins on the muscle fibre.

(*b*) Injury due to suspension of the function of the muscle.

Trauma of the muscle may result in the loss of muscle substance and its replacement by fibrous tissue or in an injury to its nerve supply. Such loss generally results in a state of fibrous contracture, or in a loss of contractile power if the nerve supply is involved. Toxins destroy the protoplasm of the cells, fibroblasts develop, and fibrous tissue replaces the muscle fibre. The injury caused to muscles by these two factors, trauma and toxæmia, has been very considerable, but it is insignificant when compared with the widespread injury that has been brought about by interference with the normal functions of muscles and their consequent atrophy. A single muscle may be directly affected by trauma but this injury may interfere with the normal action of all the other muscles of the limb for a considerable period and thus give rise to serious pathological changes in the musculature of the limb.

As we have seen, the type of muscular atrophy known as disuse atrophy is of widespread distribution and if we exclude the dystrophies and also injuries due to toxins and to direct trauma, it is reasonable to classify all atrophied muscles under one of the following three heads, according to the factors that have brought about their loss of function. (1) Muscles that have lost the power of voluntary contraction through lesion of the lower motor neurone ; these have been largely caused by injuries of the peripheral nerves. (2) Muscles whose normal contraction has been suspended by

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[1] Paper read at a meeting of the Netley Medical Society on October 11, 1919.

immobilization of the neighbouring joints—a condition so commonly seen in limbs to which splints have been applied. (3) Muscles whose contraction has been reflexly inhibited because their action causes pain in the joints whose movement they control, as for example wasting of the quadriceps in arthritis of the knee.

The dictum laid down by Abernethy that diseased parts should be kept at rest is in accordance with the principles adopted by Nature herself, and it is obviously necessary to immobilize the joints to secure proper fixation of the fragments of a fractured bone or to limit the spread of acute inflammation; but the muscles and the fibrous structures of the limb concerned have frequently been involved in the most disastrous results from the application of this principle of rest; muscles have wasted or undergone fibrous degeneration and the movement of the joints has been restricted by contraction of the adjacent fibrous tissues.

Some reference to the physiology of muscle is necessary in order to attempt to explain the cause of atrophy, and to justify the methods adopted both for prevention and cure of muscular degeneration. A muscle fibre contracts either in response to a nerve impulse along the normal channels, or it may respond to direct stimulation in virtue of its irritability. Muscles will contract feebly when pinched, and certain chemicals will provoke a response when directly applied to the exposed muscles. So far as can be ascertained, there is no difference in the nature of contraction or in the chemical changes produced by a normal nerve impulse and in that brought about by electrical or other stimulation. The irritability of a muscle fibre would appear to be somewhat akin to the irritability of the amoeba, which possesses to a feeble extent the power of response to direct stimulation and the muscle cell might be regarded as a highly specialized cell of the amoeba type, specially developed for contractile purposes and peculiarly responsible to stimuli of a nervous type. Curari, as is well known, places a block at the nerve ending, and stimuli applied to a motor nerve so affected, are powerless to produce contraction of a muscle. Stimuli applied directly to the muscle can however bring about a contraction. Muscle contraction is therefore a response to an external stimulus and the questions of loss of contractile power and of change in the muscle substance are closely associated with one another and with the causes operating to bring about loss of function in the muscle fibre. The health and condition of any cell is known to be closely associated with its function : this would appear to be especially true with regard to muscle tissue, the atrophy that takes place being a direct result of its suspension of function—the nutrition of a muscle fibre would appear to be determined by the exchange that takes place between the muscle plasma and the surrounding lymph during the acts of contraction and relaxation, the interchange thus being dependent on its exercise of function.

In response to an external stimulus, certain very complex changes take place in a muscle fibre. During contraction lactic acid is formed but there

is no consumption of O_2 or evolution of CO_2 at this stage. The process of relaxation is however accompanied by an oxidation of certain carbohydrates; oxygen is consumed and CO_2 produced. The lactic acid disappears but not by oxidation, it appears to play a very important part in the contractile process but the nature of its action is not definitely understood. The actual contraction and subsequent relaxation are very difficult to explain. As a metal rod lengthens when heated, and shortens again on cooling because different degrees of temperature alter the equilibrium of its atoms, and produce a reaction of its elastic forces which expand in the first case and contract in the second, so the molecular arrangement differs in the muscle according as it is at rest or excited, and its external form differs accordingly. The active muscle is short and thick, the inactive long and thin, and in suddenly passing from one state to the other the muscle contracts or expands not against an inherent elasticity but by an elastic reaction in order to assume the natural form of equilibrium which corresponds to its active or its inactive state (Weber).

The carbohydrates demanded by the process of oxidation are undoubtedly drawn from the surrounding lymph, through the limiting membrane of the muscle fibrils and the exchange must take place during the acts of contraction and relaxation. It would therefore appear to be a reasonable line of treatment of atrophied muscles to cause them to contract rythmically and so establish the mechanism of exchange between them and the surrounding lymph.

The treatment of muscle by active contraction will not be considered in this paper. The class to which reference will especially be made is that of muscles whose condition is such that their response to active contraction is too feeble and ineffective to bring about a sufficient interchange between its elements and the surrounding blood-stream. Of the methods of artificial stimulation generally adopted we have stimulation by massage and by electricity.

MASSAGE.

Bearing in mind that our object is to produce contraction in muscle fibres with a view to determining exchange between the fibre and the surrounding lymph, it does not appear that in massage we have an agency of any considerable value in restoring the size and tone of a wasted muscle whose response is limited to direct stimulation, as is the case in muscles suffering from reaction of degeneration. Where the nerve supply is intact, contractions in response to manipulations are largely the result of stimulation of the muscle fibre through the muscle plate, but where the nerve supply is interrupted, contractile response to manipulation must correspond to the irritability of the muscle fibres to direct stimulation, and in most cases this response to direct stimulation is very feeble. I am inclined to regard massage as effective to a large extent in such cases on account of its action on the vaso-motor system and this result will

be largely brought about by mechanical action, as the vasomotor reflexes are also affected in peripheral nerve lesion.

CONTRACTION PRODUCED BY MEANS OF ELECTRICAL STIMULATION.

In electricity we have an agency which is peculiarly effective in producing contractions of the muscle fibres, and, as is well known, by utilizing this form of energy we can obtain the most complete contractions of individual muscles or muscle groups.

For the production of contraction in muscles we can use either the faradic or interrupted galvanic current. The stimulation caused by the electrical current is due to the *displacement of the ions in the nerve* or muscle and the more *sudden the displacement* the more stimulating is the effect. A constant current is therefore incapable of producing contractions in muscles, and it is only at the make and break of the current that stimulation takes place. It has been suggested that muscles probably contain two kinds of contractile material, the striated portion and the sarcoplasm. The striated portion responds to brief stimuli and contracts rapidly, the sarcoplasm responds to longer stimuli only, and contracts slowly. A sluggish contraction would represent a contraction of the sarcoplasm. Muscles suffering from reaction of degeneration, as is well known, will not react to the currents of brief duration set up in the ordinary induction coil or faradic battery. They will however react to interrupted galvanic currents, and muscles suffering from reaction of degeneration would therefore appear to have sustained a loss of striated elements and only the sarcoplasm to have survived. This appears to have been borne out by the fact that when reaction of degeneration is fully established the character of the contraction becomes sluggish. For the treatment of muscles suffering from reaction of degeneration the galvanic current alone is effective. The faradic current is ineffective unless its voltage is enormously increased; the intensity would therefore be very great, and the excitation very painful, this therefore renders it ineffective as a practical method of producing contractions. It is well known that in the ordinary faradic battery or induction coil a current is passed across an interrupter and through a primary coil. The secondary coil is made in the form of a sheath. When the primary current is closed—that is the make—a current is induced in the secondary in the opposite direction; when the current is broken a current is induced in the secondary in the same direction. The quantity of induced electricity in both these induced waves is naturally equal, but when the current is closed self induction takes place, and consequently the resulting induced wave is prolonged and slowed down, hence the current make is of a long wave of low intensity; on the other hand when the current in the primary is broken the induced current flowing in the same direction is not opposed by self-induction, and the resulting current is therefore one of a short wave of high intensity and indeed is almost instantaneous if the rupture spark which would tend to lengthen the opening the wave is extin-

guished by the means of a condenser. In the induction coil ordinarily used, the opening wave alone is effective with its short and intense wave, but it is only effective in exciting normal muscles. It is ineffective in paralysed muscles unless its voltage is enormously increased. It is necessary to remember that several factors are concerned in the production of contractions in muscle by electrical stimulation ; the current must have a minimum of intensity and this minimum current in order to be effective must last for a definite time, this representing the velocity of excitability of the muscle. In normal muscles this is about one thousandth part of a second, in paralysed muscles velocity of excitability is much lower and the time required for a current to continue to act to produce contraction in a degenerate muscle may reach fifty thousandths of a second. Hence the ordinary faradic current is ineffective for producing contractions in paralysed muscles.

The practical problem in the treatment of muscles by electrical stimulation would appear to consist in the selection of that particular type of current that will give the best contractile response.

The selection of appropriate current is governed by two considerations: (*a*) The degree of the contractions produced. (*b*) The degree of pain caused by the current.

Under the head of "degree of contraction" we are limited to the use of currents of a definite duration in the case of degenerate muscles, but in all other muscles we can simulate normal contractions best by the use of rapidly interrupted currents.

The normal voluntary contraction is a tetanus—the effect of rapidly succeeding stimulation, and this continues as long as the stimuli act upon the muscle. Various attempts have been made to estimate the rate of stimulation in normal voluntary contractions. Helmhotz, by analysing the sound of contracting masseter muscles, came to the conclusion that the rate of stimulation was 35 per second.

Contradictory results were obtained by other workers, but the present opinion of physiologists is that nervous stimuli pass into a contracting muscle at a rate that varies between 20 stimuli per second as a minimum and 35 stimuli per second as a maximum.

The production of tetanus by artificial stimuli, however, gives a very much wider range of stimulation. A rate of twenty shocks per second has been found to be the minimum required to give tetanus. The upper limit that will produce frequency tetanus has not yet been ascertained, but tetanus has been obtained with up to 20,000 conduction shocks per second (Kronecker). It is a point of considerable interest whether we are right in assuming that the normal rate at which nerve impulses pass into a contracting muscle is really about 40 per second. The sound that is heard in contracting muscle is a low composite note of approximately 40 per second, but this note does not necessarily represent the rate at which nervous impulses are passing into the muscle, and it is but slender evidence

on which to base an estimate of the normal impulse rate. If 40 is approximately the rate of normal stimulation, we should not expect to find muscle responding to an artificial stimulation of a much higher frequency. It is doubtful if Helmhotz's estimation is correct, and the fact that with improved apparatus much more complete and effective contractions can be obtained at a high rate of stimulation, would favour the view that the normal rate of stimulation is much greater than has been supposed.

Sensation appears to be influenced by two factors: (1) The length of waves employed. (2) The uniformity of the interruptions. The effect of a current on sensation is very much influenced by the length of the waves, the stimulation of the sensory nerves being due to the movement of ions. Such movement is relatively small with short waves, but with longer waves there is a greater excursion of ions, and, consequently, the production of a considerable degree of pain. Sensation is also, to a very large extent, influenced by the uniformity of the interruptions both as regards their rate and their character. The interrupter in the old type of faradic battery was very irregular in its action, and it gave rise to currents of uneven length and varying voltage. In 1915 Dean placed a new type of faradic coil on the market—the Wilson coil. In this coil the type of interrupter employed was an adjustable steel spring, which gave an interruption of 200 to 400 per second in the primary. These interruptions were much more uniform in type than any that have hitherto been used in faradic coils, and there was consequently much less variation in the induced current, the waves were shorter, and the type of current was much less painful in its action than any that had yet been obtained with any other coils. Experimenting on the same lines, I designed with Mr. Dean a new type of telephone interrupter for induction apparatus, which, as at present constructed, will give an interruption in the primary coil of 800 to 900 per second, and the current obtained from this coil will be found to be the least painful and the most effective yet produced.

Interrupted galvanic currents, where the rate of interruption exceeds 20 per second, can also be used for the stimulation of non-degenerate muscles, and of late this interruption has been done principally by the method introduced by Frimandeau.

The Frimandeau coil is best described as a primary coil fitted at both ends of the iron core with vibrating hammers of similar type. The ordinary circuit may be described as the exciting current, and its passage causes the hammer to vibrate in the ordinary way. Frimandeau makes use of the alternate magnetization and demagnetization of the core to cause a synchronous movement of a similar hammer affixed at the opposite end of the core. A galvanic current is made to pass across the gap thus formed, and so we have a means of interrupting a constant current in a circuit which may be described as the stimulating circuit.

By employing various types of interrupters, the rate of interruption can be varied, and I have succeeded in obtaining from 2 to 1,000 interruptions

per second. The galvanic current, so interrupted, can be employed for the stimulation of muscles. When the rate of interruption falls below 20 per second, single twitches are obtained in response to each stimulation. Above this rate tetanus is obtained from non-degenerate muscles, and the Frimandeau current has proved very useful in evoking effective contractions from such muscles.

For the production of tetanus I find that an interruption of from 400 to 500 per second is the most effective. Above this rate the current appears to have the character of the ordinary constant current, and at very high speed of interruption no contraction whatever can be obtained.

The nature of the interruptions at speeds of over 50 per second is most probably not a complete make and break, and the current is most probably of an undulating type, the resistance across the gap never being sufficient to completely interrupt the passage of the current.

That artificial stimulation will bring about an improvement in the size and tone of a muscle group has been conclusively proved in practice by the actual measurement of degenerate muscles, which, treated by artificial stimulation for some months after the injury, were found to have increased in size and improved in tone—although operation subsequently confirmed the diagnosis of complete interruption of their nerve supply.

THE PROPHYLAXIS OF MALARIA IN DAR-ES-SALAAM, EAST AFRICA.

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The opinion of the German Sanitation Authorities regarding the prophylaxis of malaria in Dar-es-Salaam, East Africa, seems to have been that any efforts toward eradicating the carrier, the various anopheline species of mosquito, were not and would not be effective without enormous expense. Furthermore, that it would be impossible to reduce the prevalence of anopheles to any great extent.

They placed their faith on the alternative method of prophylaxis by administering quinine to the populace under compulsion.

Ollwig, in his Report on the Investigations into Malaria in Dar-es-Salaam, 1910-1912, makes the following statements:—

Two methods appeared possible, viz:—

(1) Killing the anopheles, the carrier.

(2) Killing the parasite in man.

He further states, "In my opinion the first method is impossible to carry out in Dar-es-Salaam, considering that for the period of two months after the rainy season the greater area in the town is one vast swamp. As this water disappears, numbers of little pools are left, all of them potential anopheles breeding grounds. Therefore I consider that war on the mosquito in Dar-es-Salaam is useless. Therefore we decided to adopt the second method, viz., to kill the parasite in man."

I wish to express an opinion differing entirely from this point of view and to show in the following Report on the Prophylaxis of Malaria, the advantages obtained by following the methods used by the Suez Canal Company in Ismailia and by the Government of the United States of America in Panama and the Southern States, which are based primarily on the elimination of the carrier, the anopheles mosquito.

The great objection to the German method of administering quinine to the population of Dar-es-Salaam under compulsion, is the fact that the population is very largely Negroid and Indian, thus making it impossible to enforce quinine being taken generally or in sufficient quantity, owing to the indifference of the Native to any measure which he cannot see directly affects him. The expense of quinine and the difficulty of dispensing it in a manner likely to be effective is also an added objection.

It is practically impossible to watch and control the large numbers of Native children, which are the main reservoir for the disease, and furthermore, the Native population shifts a good deal which prevents concerted action.

There seems little doubt that the systematic administration of quinine is, under certain circumstances, of great value, but it would appear that for the reasons previously stated, it is not the primary basis for the elimination of the disease.

Orenstein in the *Journal of the American Medical Association*, 1914, vol. 63, No. 22, pp. 1931-53, states that in his opinion the methods adopted by Ollwig were unsatisfactory and that he had come to the conclusion that prophylaxis by quinine alone, as practised by the German authorities in Dar-es-Salaam, was useless. That he had encountered so much opposition, while in charge of antimalarial work in Dar-es-Salaam, from the German authorities, that he could make very little headway, as he could not get them to see that prophylaxis after Ross's methods was the real solution.

Control Measures against Mosquitoes in Dar-es-Salaam.

The question has arisen from time to time as to whether mosquitoes can be controlled or combated best in the adult stage or the immature stages, or by a combination of both methods.

I believe that success can only be obtained by devoting all efforts to eradicating the breeding grounds and destroying the immature stages.

Spraying was tried for the adults many times at Dar-es-Salaam, but with little or no success in proportion to the expenditure of time and labour.

A solution of ten per cent to fifteen per cent formalin and water was used, but the ease with which the adults are disturbed makes the target offered very difficult and this method seemed to have no appreciable effect in the long run.

A solution of creosote ten per cent and water was also used, but the discomfort caused to the inmates of houses, especially in hospital wards, again necessitated abandoning spraying.

It was also soon found that unless the breeding places of the adults were destroyed, in one or two days' time there was no decrease in the number of adults and perpetual spraying would be necessary to control appreciably the infestation.

The use of repellents as a preventive measure is dealt with further on and these also, owing to the discomfort caused to the person and the possibility of irritation to the skin, proved of little value and could only be used in emergencies of short duration where no other remedies were available, owing to lack of time and labour.

Experiments with traps for adults seemed to show that the numbers caught by this means were insignificant as regards reducing the general prevalence, and the fact that as many males as females were caught again reduces their efficiency, since the numbers of females which escape to breed are the main factors in the subsequent increase. The point must

be conceded, however, that a large number of infected females are caught by this method.

Working Methods used in the Elimination of Breeding Grounds.

There are three main practical lines on which the destruction of the immature stages may be carried out:—

(*a*) The elimination of all stagnant water by draining and filling in, or causing a flow of water sufficient to prevent breeding.

(*b*) The use of oils on the surface and chemicals in the water to destroy the larvæ.

(*c*) The use and introduction of natural enemies such as fish, etc., where the method (*b*) is impracticable.

Methods used in the Drainage and Control of Swamp Land.

The main portion of the town of Dar-es-Salaam is situated on an isthmus, with a long sandy coast line, and extends right up to the sea front.

The town proper, though rather low lying, has quite a good fall to the sea. At the back, well away from the town and to the south there are numerous small hills and ridges intercepted by steep ravines, whose valleys often become swamps. Through these slow moving fresh water streams flow. There is plenty of sea-board free from swamp land which is comparatively easy to keep free of anopheline breeding grounds.

The geological formation of Dar-es-Salaam is as follows: The basis is coral rock. On top of this is a layer of clay, with another layer of sandy clay in some instances. The surface is covered by a heavy sand, with very occasional out-croppings of coral rock, and alluvial deposits of black silt are found in the gullies and ravines.

The sides of the valleys and ravines are usually steep and, owing to the porous nature of the surface sand, the surface water sinks very rapidly down until it meets the clay bed, causing a line of seepage extending often the entire length of the ravine about half way down the steep slopes.

These "weeping surfaces" form small puddles over a large area, which if not controlled cause numbers of breeding places, which are especially favourable to anopheles.

The eradication of this type of breeding place has been accomplished by making straight drains diagonally down the hill-sides "feather-stitch" fashion, and filling in the intervening inequalities.

The methods previously attempted in Dar-es-Salaam, probably owing to lack of labour and support for the work, of connecting up the puddles by small irregular drains often leading to a drain actually made parallel to the hill-side, caused in most cases an even greater amount of surface water than before, the small drains becoming clogged with debris and themselves forming small puddles.

Great care must be used in the construction of "seepage" drainage. The drains should be made not more than two feet wide at the top, with sloping sides at an angle of forty-five degrees. The bottom should not be more than eight inches to a foot wide, the width of an ordinary straight spade. The sides should be beaten flat and kept free from all verdure.

A most excellent example of the benefits derived from proper draining was shown by the work done on Gerrassani Creek Basin.

FIG. 1.—Method of draining "weeping" surface of hillside, showing construction of straight drains with properly sloped sides leading diagonally to main drain in valley. The hillside is carried down to fill in all depressions, causing any surface water to percolate through at once to desired level. By keeping the drains clear the Cyprianid minnows and other larvæ-eating fish are able to pass freely to the source. The drains are made at least five yards above the springs so that there is no depression at the source.

The valley was originally drained by a slow moving stream which entered a large pool with reed beds at the sides. This was the breeding ground of thousands of anopheles.

The stream entered the pool in an "S" shaped channel which was continually overflowing, causing swampy areas. This was straightened by cutting through the two bends and filling up the old channel.

The result was a rapid flow of water along the entire channel of the stream. The reed beds were pulled up, not cut down, thus once and for all eliminating the most dangerous breeding grounds.

Sand and earth were pulled down from the hill-sides and the whole periphery straightened with clean sloping sides. "Feather-stitch" drains were made along the hill-side wherever seepage occurred and drainage made into the main basin. The intervening spaces of low lying swampy ground were filled in from the hill-sides by the simple method of passing down the earth from above in baskets swung along a chain of men.

Fig. 2.—Incorrect method of draining by linking up surface water by small irregular drains. During the rains this type of drain becomes choked with débris and the amount of slowly moving and stagnant surface water is increased rather than decreased.

All verdure was cut back at least ten feet from the periphery of the water and the drains were cleaned once a month, allowing the "Top" minnows to pass freely up and down the drains, keeping them free of larvæ.

What appeared in the first instance to be an almost impossible undertaking, was really quite a simple matter, when the work was seriously attempted "en masse" with sufficient labour, under skilled direction. About two hundred natives were used on and off, and about fifty steadily for two months. After the first work was done properly, it was quite an easy matter to keep the whole area in good control.

The cost of labour was insignificant as compared to the benefits derived

from the reduction of anopheles. Before the work was undertaken, the camps and houses on the hills near this area were infested with hundreds of anopheles, which as it progressed gradually decreased to very small numbers. The cases of malaria, which were very numerous, also very appreciably declined, though large numbers of fresh troops from infected areas were continually passing through.

FIG. 3.—The engineering section at work constructing drainage system on hill-side. The hill-side is drained by the "feather-stitch" system, straight drains made with an angle of 45 at the sides through the "weeping surfaces," allowing the water to pass rapidly along to the main drain shown in the foreground. The intervening swamp areas are filled in by pulling down the hill-side and being raised to the required level. All verdure except large banana trees is cleared to allow the swamp to dry.

THE VALUE OF CLEARING VEGETATION WITH REGARD TO THE REDUCTION OF ADULT MOSQUITOES AND BREEDING PLACES.

The clearing of vegetation plays a most important part in the control of mosquitoes. By cutting close all grass and "bush" in the vicinity of dwellings, the chances of puddles and empty receptacles, which may be the breeding places for larvæ, being overlooked, are thereby greatly reduced. In addition, the cutting down of all verdure causes any shallow surface water to dry up before the adult stage has been reached.

It is astonishing how little water is required to support enormous numbers of larvæ after they have reached the third moult and the writer

has often found that though large puddles have almost disappeared, yet in the few ounces of water left at the lowest points of depression, thousands of larvæ were existing in almost liquid mud, continuing in this state as long as there was any breathing surface. The larger proportion of such larvæ develop into adults with great rapidity soon after the next shower of rain falls. By carefully cutting down the grass at the beginning of the "dry" season, many such places will usually be discovered.

FIG. 4.—Illustration showing previous method of draining in Dar-es-Salaam. The sides have been made at too steep an angle, with the result that they have fallen in, and depressions are formed along the bottom, increasing rather than decreasing the anopheline breeding area.

This curious phenomenon has been commented on by Bousfield at Khartoum, and who found larvæ in wet sand.

Clearing the ground around dwellings has an undoubted effect in reducing the infestation by adult mosquitoes, as the adults are loath to cross a broad sun-lit space.

On the approach of dusk I have many times seen swarms of mosquitoes arising from the long grass in which they had concealed themselves during the day from the rays of the sun. A sweep-net dragged through the grass in the vicinity of a stream invariably yields many mosquitoes. In fact the swarms arising from the grass as night approaches have often been so noticeable, that the layman is frequently of the opinion that the mosquitoes

" breed " in the grass and consequently devotes all energy to the clearing of the grass instead of the more important work of eliminating the standing water in the vicinity.

Mango trees are dangerous near houses, as the interior of the heavy foliage is often very dark, affording the shelter from the sun so sought after by anopheles. In addition, the tree-trunks often contain deep holes which, though in the writer's opinion, are not the breeding places usually chosen by anopheles yet may become so under certain conditions.

The type of foliage and shade tree desirable near dwellings is a type of tree such as the cassuarina and small leafed shrubs with thin foliage at the base.

The writer frequently found engorged anopheles in the heavy foliage of mango trees, waiting to digest their meal before making another attack at night.

The question arose in Dar-es-Salaam as to whether the coconut plantations were anopheline breeding sources. Natives were many times sent up the trees to investigate before and after intervals of rain, but in no instance were any anopheles larvæ discovered.

This may not apply to the oil palms or trees in which a greater surface area of water may be found.

The Danger of Live-Stock passing near Dwellings through Ground which may become inundated.

A very important point in the elimination of breeding areas is the control of all live stock near the vicinity of water. After rain every hoof-mark left in the ground becomes a potential breeding place for anopheles and such places are a most difficult type to eradicate owing to the area of ground covered and the impossibility of draining off the water from hundreds of small depressions. The best remedy is the filling-in and levelling of the ground, fencing it off, and preventing live-stock from passing over except at controlled points.

Spraying with oil in such cases must be done after every shower, and if done properly so that an unbroken film of oil is left on each puddle the method is very effective, but a large quantity of oil is required and the cause of the trouble is not removed.

Next to reed-swamps, a slow moving stream, along whose banks human beings and live-stock wander, is the most favourable breeding ground for anopheles, as the water collected in the footprints contains the requisite amount of algæ and food-material which seem to be essential for the development of anopheline species.

In Dar-es-Salaam, special police were employed to patrol such areas as Gerrassani Basin and to keep all live-stock to well-defined crossings and watering places, which were attended to each week.

The Destruction of the Immature Stages of Mosquitoes by means of Oiling the Surface of the Water.

As the larvæ of anopheline species of mosquitoes must come up to the surface of the water to breathe, a mixture of oil of the right surface-tension, sprayed over the water, forms a film which clogs the breathing tubes and causes the death of the larvæ from asphyxiation. The best mixture was found to be half crude oil and half kerosene.

The surface-tension of the oil used is a very important point; too heavy a mixture of oil will only cause congealed masses and a very thin and volatile film, resultant from the lighter constituents of the oil.

The use of unmixed commercial kerosene will produce a thin film of too volatile a nature.

The ordinary pump sprays used for disinfection purposes do very well for distributing the oil, especially if fitted with a Vermorel nozzle.

Short hand sprays are very useful for work on cesspools and drains. Difficulty is often encountered in successfully oiling water, the surface of which is strongly agitated by wind. The oil film is often blown into the sides, leaving large uncovered spaces.

The following experiment was tried, which proved quite successful on a small pond: Frames were made of the dried stems of the sisal plant, lashed horizontally, and laid on the surface of the water, dividing it into squares. This prevented the entire film of oil being driven to the sides.

The use of oil on cesspools and wells is a far better method of destroying larvæ than chemicals or disinfectants, as only a very small quantity of oil is needed, and in the case of wells the water is not affected as regards its use for drinking and washing if the intake is below the surface, so as not to disturb the surface film of oil.

The Use of "Top" Minnows and other Fish as a Method of Controlling the Immature Stages of Mosquitoes.

The use of fish as a method of destroying larvæ was found to be most effective.

Actual experience showed that indigenous minnows destroyed enormous numbers of larvæ, and that if the vegetation was properly cleared, allowing access to the entire periphery of water, very little breeding ensued. There must be an ultimate balance attained between the increase of the larvæ in their natural state and their destruction by the fish; but any preponderance in the increase of the larvæ seems to be due to the fact that they are able to escape capture amongst the aquatic vegetation, which prevents the fish following.

It was found that if the drains were kept clear the fish travelled the entire length, and in such cases the writer was invariably unable to discover any larvæ existing.

In addition to the minnows, fish of the genera *Gobius* and *Electris* very readily devoured all larvæ which descended to the bottom of the water, and doubtless many other fish play a very important part in the control of mosquito larvæ other than the "top minnows."

On a shortage of oil occurring, it was found necessary to employ an alternative method with regard to tanks and house cisterns.

Various species of small fish were captured and kept in tanks for a week or more without food. They were then transported in wooden buckets and placed in the infested tanks. In an astonishingly short space of time they had completely destroyed all larvæ. The period varied from twelve to twenty-four hours. Six fish were able to cope with a heavily-infested tank of an average capacity of 200 cubic feet.

The fish were then re-caught and returned to the stock tanks. In the case of ornamental ponds in the Botanical Gardens, fish were introduced, and, contrary to expectation, instead of any decrease in numbers being observed, in six months' time they had increased. On no occasion after the introduction of fish to these ponds was there any evidence of larvæ existing.

Doctor Spurrier, who was previously in charge of the anti-malarial work in Dar-es-Salaam, imported a small number of fish from Zanzibar and the Seychelles, and also tried some experiments with local fish.

The local species, however, proved quite as effective as the imported species without the extra expense of transportation being incurred.

The species of fish used were plentiful in all fresh water streams and even in the brackish water in Gerrassani Creek basin.

The following list is given of the species of fish in the Dar-es-Salaam region found to be the most effective for practical work as larvicides. The species were determined by Mr. G. A. Boulenger, F.R.S., F.Z.S., to whom the writer wishes to express his thanks.

Tilapia nilotica, L.
T. ovata, Stdr.
T. natalensis, M. Web.
T. mossambica, Peters.
Electris fusca, Bl. Schn.
Gobius giuris, Ham. Buch.
Fundulus guentheri, Pfeffer.
Ambassis commersonii, C. and V.
Mugil macrolepis, A. Smith.

Observations on the Life-cycle of Some of the Species of Mosquitoes found in Dar-es-Salaam, East Africa.

Experiments were conducted with a view to obtaining information on the exact period of the life-cycle of the various species of mosquito, in order to ascertain how often remedial measures should be applied to infested areas.

The results are appended in tabulated form.

EXPERIMENTS WITH CULEX FATIGANS WIEDEMANN.

Four engorged females, captured in houses, were placed in especially constructed breeding cages containing four different types of water, in order to see what development took place under different natural conditions.

Experiment No. 1 contained a mixture of urine, horse manure and rain water.

Experiment No. 2 contained pure rain water with no further contamination.

Experiment No. 3 contained tap water from the town water supply.

Experiment No. 4 contained thirty per cent sea water and seventy per cent rain water.

From an examination of the table appended, it will be seen that the minimum period for the incubation of the eggs was under twenty-four hours, the minimum period for the larval stage under one hundred and twenty hours, and the minimum period of the pupal stage under forty-eight hours. These totals give a minimum life-cycle of under one hundred and ninety-two hours.

Therefore, if infested water was oiled every seven days, any completion of the life-cycle would be prevented.

The composition of the water is a very important factor in development and the writer has often found that cesspool water of the foulest type is the best medium for breeding culicines.

I have never found any instances of anopheles breeding in cesspools. The anophelines seem to be very particular in their choice of breeding places, avoiding water which is in the least contaminated by sewage.

Metal cisterns in the roofs of houses were carefully watched but in no instance were anopheles found, though culex and stegomyia were almost invariably present in uncovered tanks. Anopheles seem to require a large open surface and water containing green algæ.

Anopheles develop most rapidly in rain-filled ditches with plenty of growing plant life. The larvæ were found on occasions in open stone tanks and horse troughs; but these again contained the requisite plant life of algæ, potamogeton, etc.

No species of anopheles was ever found breeding in salt or brackish water. The following instance gives good proof of this. The end of one long drain leading to the sea was closed by a tidal sluice gate, the tidal water on rising at the highest tides overflowed a large area leaving brackish puddles. These puddles were most carefully watched, but anopheline larvæ were never found in them, though the "crab-hole" mosquito, *Ochlerotatus pembænsis*, was in large numbers in every inundated crab-hole, in almost pure sea-water.

Mangrove swamps along the sea shore were carefully watched and examined and anopheline larvæ were never found in the tidal area, but the "weeping" surface along the high ground, where the fresh springs oozed

out after percolating through the coral rock to sea level were a source of great danger, anopheles breeding extensively therein.

It was found almost impossible to breed anopheles in the laboratory for experimental work in such receptacles as glass jam pots, even when the requisite rain water and algæ were used. The restricted surface area seemed to be the cause.

The difficulty was overcome by using large earthenware jars about two feet in diameter and a foot deep. When mud, grass and rain-water were used in this type of receptacle, anopheles were bred very successfully.

In some of the experiments made, in which no fresh rain-water was added, the anopheline larvæ remained in the half-grown stage, quite active and flourishing, for as long as three weeks, and on the introduction of fresh rain-water, a sudden and very rapid development took place, the larvæ reaching the full grown stage in two days, pupating, and adults emerging after a further fifty to seventy-two hours.

The following list is given of the species of mosquitoes found by the writer in Dar-es-Salaam, East Africa.

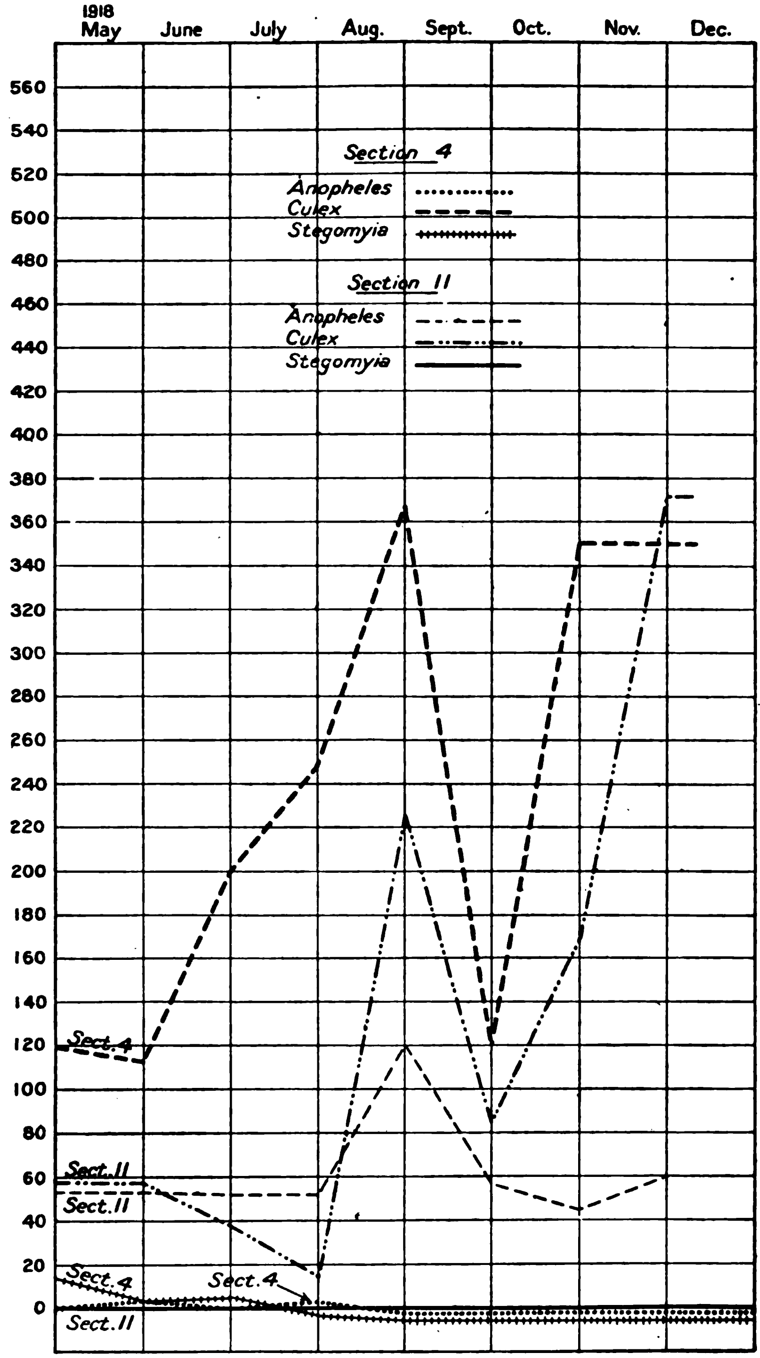
List of the Species of Mosquitoes found at Dar-es-Salaam, East Africa, 1918-19.

Anopheles: *A. funesta* Giles.
A. costalis Loew.
A. maculipalpis Giles.
Banksinella: *B. lineatopennis* Ludlow.
Culex. *C. fatigans* Wied.
C. bitæniorynchus Giles.
C. consimilis Newstead.
C. tigripes Grandpre.
C. anulsioris Theo.
C. invidiosus Theo.
C. duttoni Theo.
C. thalassius Theo.
C. sitiens Wied.
C. aurantapex Edwards.
C. laurenti Newstead.
C. simpsoni Theo.
Stegomyia: *S. fasciata* Fab.
S. simpsoni Theo.
Ectmopodites: *E. quinquevittatus* Theo.
Toxorhynchites: *T. brevipalpis* Theo.
Mansoniaides: *M. uniformis* Theo.
Culicomyia: *C. nebulosa* Theo.
Ochlerotatus: *O. pembaensis* Theo.
O. albocephalus Theo.
Harpagomyia: *H. tæniarostris* Theo.
Uranotænia: *U. mashonaensis* Theo.

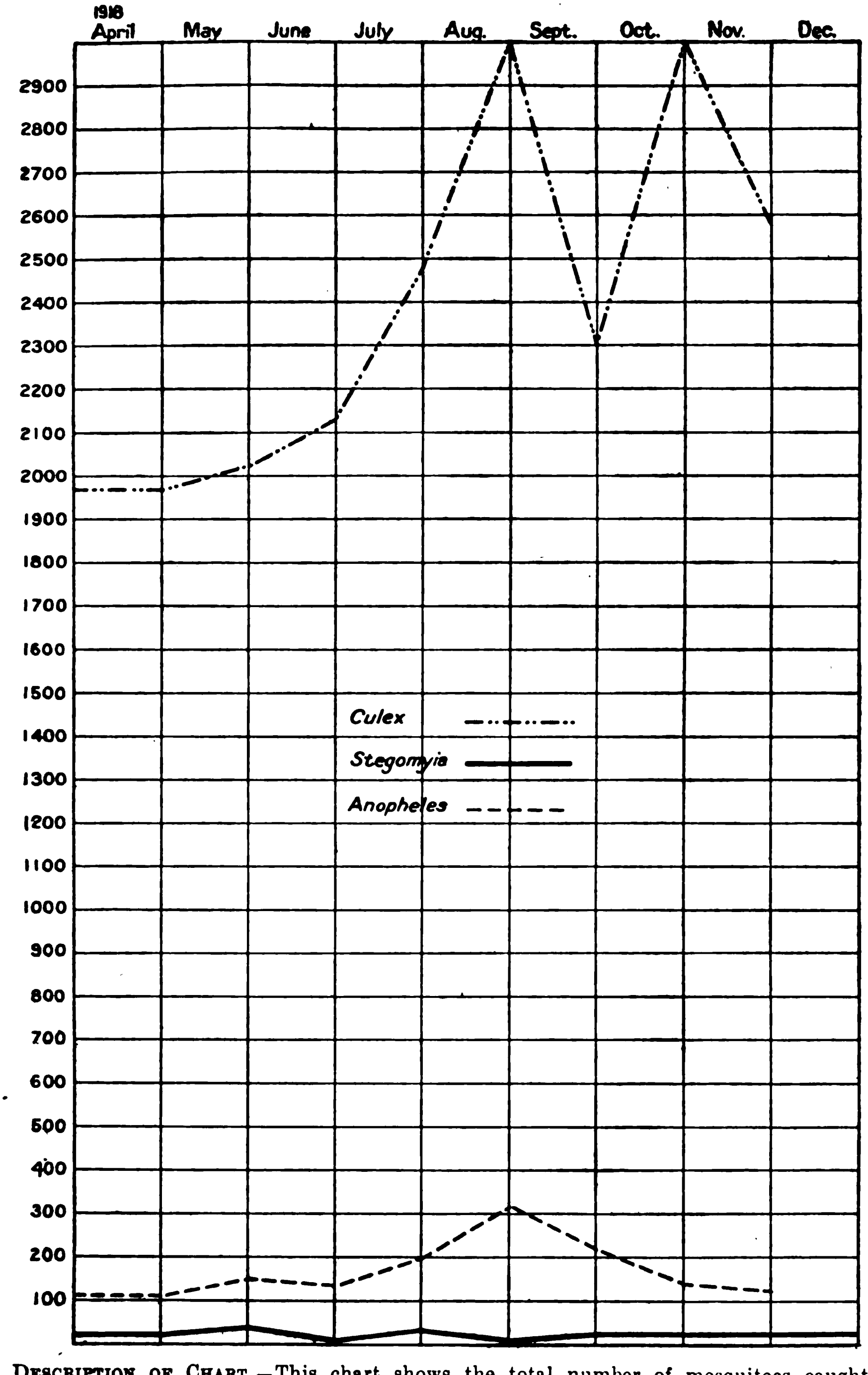
The above mosquitoes were identified by Mr. Edwards, F.E.S., of the British Museum, to whom the writer wishes to express his thanks.

The Organization of the Mosquito Brigade, Dar-es-Salaam, East Africa.

Sporadic and unorganized work on the control of mosquitoes is merely waste of time and effort. Without a properly planned routine of work, and, in addition, proper laboratory experiments to determine the life history of the species in a given area, and carefully collected statistics on adult



Description of Chart.—This chart shows the numbers of mosquitoes caught per month in three selected houses in each section, 4 and 11, of Dar-es-Salaam, E. Africa. The catches were made at the same hour and the same day every week, in order to get a basis for estimating the prevalence of the species and the relation between the destruction of the breeding grounds and the decrease of the adults. Section 11 invariably showed the heaviest infestation, as regards anopheles, of all the twelve areas into which the town and its environs were divided. Section 4, the centre of the town, was practically free of anopheles at all times, only five adults being taken in six months. The making of accurate records of the prevalence of the adults at given points was of the greatest value in estimating the value of the control measures used, and enabled special concentration to be made on the most important areas at the critical time when the heaviest infestation occurred.



Description of Chart.—This chart shows the total number of mosquitoes caught in Dar-es-Salaam from April to December, 1918. It will be seen that the numbers of culicines are greatly in excess of the anophelines. This was owing to the special efforts made in the anopheline areas and to the fact that the breeding places of the culicines were often very inaccessible, being in concealed cesspools around the houses. Though from the map the breeding places of the stegomyia are shown to be the most numerous, yet control measures placed them in the minority, as regards the adults. Stegomyia are also very local in their habits and the adults usually confine themselves to within a hundred yards of their breeding places, so that absence of adults in one spot does not prove that houses near by may not be seriously infested. Results show that stegomyia are easily controlled in any definite area.

prevalence through the seasons, the ordinary remedial measures taken fail, because some vital point of infestation is left unguarded.

The only way to estimate the results of remedial measures as regards the breeding places is to make collections of all adults in certain situations at stated points bearing on the distribution of flight. These statistics must be gained from catches made at the same time of day, and at the same intervals of time, and must be absolutely thorough.

The Personnel of the Mosquito Brigade, Dar-es-Salaam.

The force employed was as follows: One European staff-serjeant, R.A.M.C., 1 Goanese overseer (in charge Engineering Squad), 6 native N.C.Os., 3 laboratory attendants, 60 native rank and file.

The personnel was divided into three sections:—

Section No. 1.—Inspection and Oiling Gangs.

Squad No. 1: One serjeant, 10 inspectors, 5 oilers.

Squad No. 2: One corporal, 1 lance corporal, 10 inspectors, 5 oilers.

The two squads worked independently at opposite ends of the town, and their duties were to search for all possible breeding places, to take necessary action of emptying all vessels containing larvæ, or likely to do so; to oil all infested cesspools, etc.; to report any work necessary for the engineering section; to make the adult catches in the appointed houses; to introduce fish if necessary; to report all cases of house owners and O.C.'s camps who neglected to keep their premises free from standing water.

Specimens of immature stages found were brought to the laboratory for examination. The N.C.Os. were supplied with forms and note-books, and records were kept of the infested house number, the section of the town, type of breeding place and action taken.

The town was divided into twelve sections, each section being visited every seven days.

The men were given lectures from large coloured diagrams of the different species of mosquitoes in all stages, and their life history.

Uniforms were provided and strict discipline kept. A spirit of *esprit de corps* was encouraged, but civility and tact was insisted on in the discharge of their duties. There is no doubt that a uniform is of the greatest advantage to an organization of this kind. The ordinary native will often strenuously oppose another native without a uniform, and prevent him from entering his premises, while he will accept a uniformed man as a matter of course.

Care must be taken that the privilege of a uniform is not abused, and in such cases severe punishment is necessary. The natives became very keen on their work, and showed surprising intelligence in discovering breeding places and distinguishing species.

Section 2.—*The Engineering Section.*

The Engineering Section was composed of one Goanese overseer who had been trained by Orenstein under the German *régime*, and had a most excellent knowledge of drainage and levels; one native serjeant and corporal and thirty rank and file. These men were trained in digging the special type of drains, levelling and clearing. When large numbers of unskilled labourers were employed, such as prisoners of war, on a big area, these men were invaluable as head men over the gangs. They were also equipped with uniforms.

Section 3.—*Laboratory Attendants.*

Three laboratory attendants in charge of a native corporal did all the rough laboratory work. They were chosen for their intelligence, and were trained to mount specimens, record the routine work, and investigate special breeding areas.

Methods Used in Keeping Maps and Records.

Large scale maps of the town and its environs were procured. On a breeding place being reported, it was at once given an experiment number, marked on the monthly map and entered in a ledger showing section of town, species, action taken, etc. By this method, uniformity was obtained in making statistics.

Adult catches were entered in special forms, by means of which rapid calculations could be made as to species, sex, time, etc.

If an especially heavy infestation was found, the environs were searched until the breeding places were discovered, usually with great success, the numbers of adults very noticeably decreasing after such special efforts in a given area.

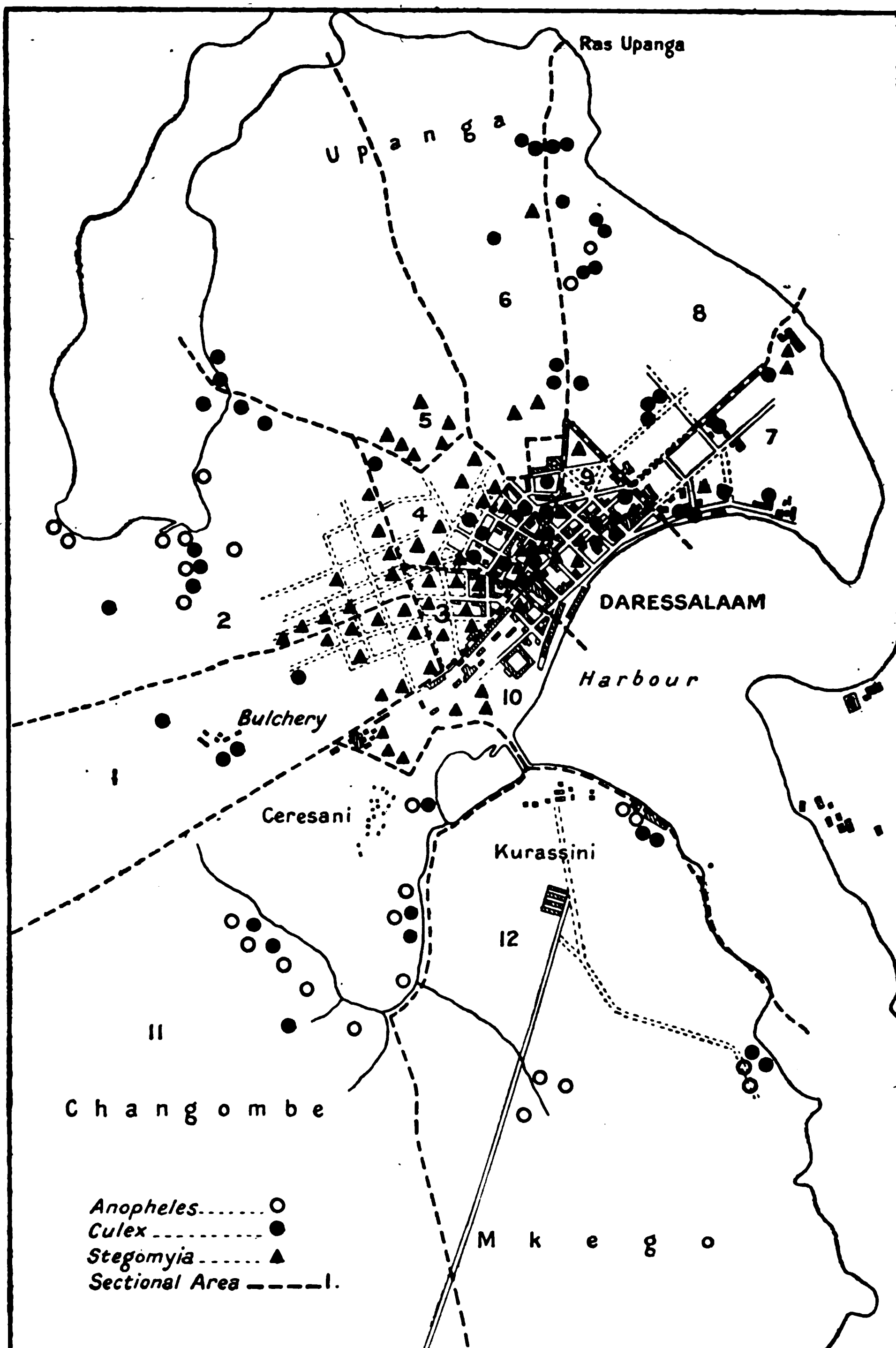
By making these catches the unsuspected presence of anophelines in supposedly free areas was often brought to notice, particularly in important areas such as the vicinity of hospitals, and special search being made at once for the breeding places resulted in checking the infestation before it could spread.

Experiments with Repellent Chemicals used as Culicifuges.

At the request of the medical authorities at the War Office, experiments were undertaken to ascertain the value of certain chemicals to be used on the human body as repellents against the attacks of mosquitoes.

The results are set forth in the appended tabulated forms. The species used in the experiments were *Stegomyia fasciata* Fabr.; *Culex fatigans*, Wiedemann; *Pyretopherus costalis*, Loew.

Some considerable difficulty was experienced in keeping the adults alive for a sufficient period. The first cages were made of glass. These were



Plan of Dar-es-Salaam and Environs.

unsatisfactory and finally the difficulty was overcome by making the cages with fine tulle, with glass tops, for the purpose of observation.

The actual biting experiments were carried on as follows:—

The adults were transferred from the breeding cages to large cages about two feet long and one foot in diameter, made of thin slips of tin covered with fine netting, with a sleeve at one end. Two of these were used, one as a control and one for the culicifuge.

The mixture was rubbed on the right arm of a native, who then extended his arm and inserted it into one of the cages, while at the same time another native placed his arm in the control cage, about sixteen feet away, in the same room.

The behaviour of the mosquitoes was very carefully watched. Great care was taken to have the adults all of the same age in order to get uniformity of desire.

Freshly emerged adults do not exhibit much desire to bite. The presence of males seems to be an incentive to bite and copulation usually took place among the adults used before they were transferred from the breeding places.

Owing to the fact that an experienced chemist could not be specially detailed for the work, some difficulty was found in getting the components to mix, such as cinchona, sodium sulphate and water.

Some experiments were carried out on the legs of a European, the legs being placed wide apart, one in each cage. There did not seem to be any difference in the attraction of a native or a European as a subject.

The results were tabulated on specially printed forms. This was done in order to secure uniformity.

Some of the mixtures used were very effective in warding off the attacks of mosquitoes, but so nauseating in their odour as to be of no practical value. Bamber oil was effective, but it has a very clinging and to some people a most sickening odour. Other good mixtures as cinchona, peppermint oil and vaseline are so greasy as to be very objectionable in addition to the unpleasant smell.

It would appear that one of the mixtures used, Mixture No. 2, oil of peppermint 1 part, oil of cinnamon 1 part, vaseline 2 parts, was almost chemo-tropic in its action, actually attracting and stimulating efforts toward biting, though so overpowering as to cause suffocation and death.

In conclusion it seems an open question whether culicifuges are of real value, except possibly under exceptional circumstances. Firstly owing to the fact that even the most successful preparations have an odour that is so unpleasant after continued application that great difficulty will be found in enforcing their use, and secondly, that the use of culicifuges may tend towards the disregard of the proved remedial measures, viz: the use of mosquito nets, regular prophylaxis by quinine and the elimination of the carrier, the anopheline mosquito.

The best mixture as regards efficiency in warding off attacks of

mosquitoes and which has neither too unpleasant an odour nor is too greasy and irritant, is Mixture No. 10: soft soap 1 ounce, paraffin 20 cubic centimetres, eucalyptus oil 20 cubic centimetres.

The Results of Remedial Measures.

In 1917 the percentage of troops in Dar-es-Salaam suffering from malaria was very heavy, especially in the Main Detail Camp at Gerrassani and the Prisoners of War Camps.

Why such sites should have been selected for the main bodies of troops and Europeans remains a mystery to any one with even an elementary knowledge of tropical sanitation and hygiene as regards mosquitoes.

These camps were situated on the most dangerous areas, away from the seashore, inland, and overlooked many small, slow moving streams and reed swamps.

The faulty position of these camps was remarked upon by Major General Pike and Lieutenant Colonel Balfour when their Commission visited the places.

There was a large area within easy transport distance of the railway, but near General Headquarters, all along the sea front, which was almost free from anopheles, with only one very small swampy area. This was used for the Army Veterinary Corps and the Horse lines.

The European officers in charge of the Prisoners of War Camp seldom lasted more than three weeks, invariably going down with fever. The tents swarmed with anopheles before the adjacent valley was drained, and even after great effort was made to keep the area under control, it was impossible to entirely eradicate anopheles, as was done in the main portion of the town along the seaboard.

Finally in 1918 the bulk of the European Details were removed to camps along the sea-shore. But a considerable amount of sickness could have been avoided if experience and knowledge had been used in selecting sites in the first instance.

Early in 1918 about fifty European nurses and sisters arrived in Dar-es-Salaam. Of these, so I was informed by Lieutenant Colonel Kidd, A.D.M.S., only two went down with malaria after seven months. They were living in the free area in the centre of the town. There was a possibility in this instance of one of the two cases having had a previous infection.

This was a very different story from the events of 1917, during which period I believe I am correct in saying that actually seventy per cent of the troops of some units, stationed in Dar-es-Salaam, were on the sick list suffering from malaria.

A mosquito survey was made in 1917 by Dr. Aders, who sent in a report to Headquarters. His services were lent by the Zanzibar Government, but he returned to Zanzibar after making his report.

Some excellent preliminary work was done by Dr. Spurrier, C.M.G., O.B.E., who was also lent by the Zanzibar Government. He received however very inadequate support both as regards personnel and equipment. He informed me that he found great difficulty in obtaining facilities for the work, which no doubt was partly due to the fact that he was a civilian in military employ. I wish to express my thanks to him for the kind way in which he placed all the knowledge he had gained at my disposal.

After serious efforts towards prophylactic measures were undertaken by the writer in 1918 against mosquitoes, the opinion expressed to me by the Medical Command in Dar-es-Salaam was that there had been a very appreciable decrease in the cases of malaria originating in Dar-es-Salaam, and that the money, time and effort was very well repaid in the consequent efficiency of the troops.

The general public opinion seemed to be that the numbers of mosquitoes had been greatly reduced and that there was no doubt of the great improvement in the situation from 1917 to 1919. Many units who were stationed in Dar-es-Salaam stated that the mosquitoes were almost unbearable in 1917, while in 1918 there was little inconvenience except from a few isolated cases of infestation by *Stegomyia fasciata*, due to the German system of underground drainage which was so difficult to cope with.

EXPERIMENTS WITH CHEMICALS AS REPELLENTS AGAINST *Culex fatigans* WIED., *Stegomyia fasciata* FABR. AND *Anopheles costalis*.

Experiment No. Chemicals used	Number used	Date hatched	Date of experiment	Hour	Locality	Temperature Deg. F.	Species	Control cage: Number of bites recorded in five-minute periods 1st	2nd	3rd	4th	5th	6th	Remarks	Culicifuge cage: Number of bites recorded in five-minute periods 1st	2nd	3rd	4th	5th	6th	Remarks
Experiment No. 1. Mixture 16. Soft soap, 1 oz.; paraffin, 20 c.c.; citronella oil, 15 c.c.	4 in each cage	July 23, 1918	July 25, 1918	3.30 p.m.	Laboratory	84	*S. fasciata*	1	2	0	0	1	0	Cloudy day, light breeze, showery. Biting freely	0	0	0	0	0	0	A good repellent, but greasy and unpleasant as regards application. The odour is rather sickening
Experiment No. 2. Mixture 2. Oil peppermint, 1 c.c.; oil cinnamon, 1 c.c.; vaseline, 2 oz.	10 in each cage	July 24	July 26	4 p.m.	Room with one window	84	*C. fatigans*	0	0	0	0	0	0	Cloudy, light breeze, warm. Not biting freely	0	1	1	0	0	0	Two attempted to bite but fell to bottom of cage in one minute. At the end of five to six minutes three more unable to fly
Experiment No. 3. Mixture 5. Bamber oil	10 in each cage	July 25	July 27	2.30 p.m.	Laboratory	84	,,	0	0	0	0	0	1	Warm and damp. Fairly bright light	0	0	0	0	0	0	Made no attempt to bite
Experiment No. 4. Mixture 3. Camphor, 1 oz.; napthaline, 4 oz.; vaseline, 1 oz.	10 in each cage	July 25	July 27	3.15 p.m.	Verandah	84	,,	1	0	0	0	0	0	Bright light ..	1	0	0	0	0	0	Pierced skin but flew away without engorging
Experiment No. 5. Mixture 4. Napthaline, 1 oz.; soft soap, 3 oz.	10 in each cage	July 25	July 27	3.45 p.m.	Dark bedroom	84	,,	0	0	1	0	0	0	Very subdued light	0	0	0	0	0	0	—
Experiment No. 6. Mixture 6. Cinchona, 15 c.c.; sodii sulphas, 15 c.c.; water, 30 c.c.	10 in each cage	July 25	July 28	10 a.m.	Laboratory	83	,,	0	0	0	2	0	0	Light bright ..	0	0	0	0	0	0	Mixture does not amalgamate

Experiment No. 7. Mixture 2. Oil peppermint, 1 c.c.; oil cinnamon, 1 c.c.; vaseline, 2 oz.	12 in each cage	July 29	July 31	4.30 p.m.	Room with one window	84	*S. fasciata*	4	2	0	0	0	0	Adults were biting very fiercely	0	0	0	0	0	0	Attempted to bite the skin repeatedly but did not pierce
Experiment No. 8. Mixture 9. Eucalyptus oil, 10 c.c.; soft soap, 1 oz.; water, 30 c.c.	7 in each cage	July 30	July 31	4.30 p.m.	Room with one window	84	*C. fatigans*	0	0	0	0	0	0	Subdued light ..	0	0	0	0	0	0	The eucalyptus oil may have had the chemo-tropic property of repelling the mosquitoes in both cages
Experiment No. 9. Mixture 5. Bamber oil	12 in each cage	Aug. 7	Aug. 9	3.15 p.m.	Laboratory	84	*S. fasciata*	5	1	0	0	0	0	Bright light, damp. Warm breeze. Biting very fiercely. All became well engorged	0	0	0	0	0	0	Attempted to bite many times. Only one pierced the skin, but did not feed. A very successful repellent
Experiment No. 10. Mixture 5. Bamber oil	12 in each cage	Aug. 8	Aug. 9	4 p.m.	Verandah	84	,,	2	3	0	0	1	0	Light bright. Biting very freely. All well engorged	0	0	0	0	0	0	Did not attempt to feed at all on this occasion
Experiment No. 11. Mixture 8. Soft soap, 1 oz.; ung. picis lig., ¼ oz.; creosotum, ¼ oz.; water, 20 c.c.	12 in each cage	Aug. 18	Aug. 20	3.10 p.m.	Room with one window	83	*C. fatigans*	0	1	1	1	0	0	Light subdued. Biting freely	0	0	0	0	0	0	No attempt at biting
Experiment No. 12. Mixture 8. Soft soap, 1 oz.; ung. picis lig., ¼ oz.; creosotum, ¼ oz.; water, 20 c.c.	8 in each cage	Aug. 19	Aug. 20	3.10 p.m.	Verandah	83	,,	1	2	2	1	0	0	Bright light ..	0	0	0	0	0	0	A good repellent
Experiment No. 13. Mixture 8. Soft soap, 1 oz.; ung. picis lig. ¼ oz.; creosotum, ¼ oz.; water, 20 c.c.	10 in each cage	Aug. 20	Aug. 21	2.15 p.m.	Laboratory	86	,,	0	0	1	0	0	0	,, ,, ..	0	0	0	0	0	0	—
Experiment No. 14. Mixture 9. Soft soap, 1 oz.; water, 30 c.c.; eucalyptus oil, 10 c.c.	7 in each cage	Aug. 20	Aug. 22	2.30 p.m.	Tent	85	*S. fasciata*	1	3	1	1	0	0	Very subdued light	0	0	0	0	0	0	Effect of mixture soon wears off

EXPERIMENTS WITH CHEMICALS AS REPELLENTS AGAINST *Culex fatigans* WIED., *Stegomyia fasciata* FABR. AND *Anopheles costalis*.—*Continued.*

Experiment No. Chemicals used	Number used	Date hatched	Date of experiment	Hour	Locality	Temperature Deg. F.	Species	Control cage Number of bites recorded in five-minute periods						Remarks	Culicifuge cage Number of bites recorded in five-minute periods						Remarks
								1st	2nd	3rd	4th	5th	6th		1st	2nd	3rd	4th	5th	6th	
Experiment No. 15. Mixture 5. Bamber oil	10 in each cage	Aug. 20	Aug. 22	3 p.m.	Room with one window	85	*C. fatigans*	1	0	0	0	0	0	Bright light. Not biting freely	0	0	0	0	0	0	—
Experiment No. 16. Mixture 5. Bamber oil	7 in each cage	Aug. 20	Aug. 22	3.45 p.m.	Room with one window	85	*S. fasciata*	1	2	1	2	0	0	Fairly bright light	0	0	0	0	0	0	An excellent repellent, but very sickening odour
Experiment No. 17. Mixture 10. Eucalyptus oil, 20 c.c.; paraffin, 20 c.c.; soft soap, 1 oz.	8 in each cage	Aug. 27	Aug. 28	2 p.m.	Room with one window	85	,,	6	2	0	0	0	0	Bright light ..	0	0	0	0	0	0	Very effective
Experiment No. 18. Mixture 8. Soft soap, 1 oz.; ung. picis lig., ½ oz.; creosotum, ½ oz.; water, 20 c.c.	8 in each cage	Aug. 26	Aug. 28	2 p.m.	Laboratory	85	*C. fatigans*	1	2	0	0	0	0	,, ,, ..	0	0	0	0	0	0	Very powerful repellent
Experiment No. 20. Mixture 1. Soft soap, 1 oz.; paraffin, 30 c.c.; bamber oil, 30 c.c.	10 in each cage	Aug. 28	Aug. 29	6.15 p.m.	Verandah	80	,,	1	0	0	1	0	1	Very subdued light	0	0	0	0	0	0	Subject, European, on legs
Experiment No. 21. Mixture 1. Soft soap, 1 oz.; paraffin, 30 c.c.; bamber oil, 30 c.c.	10 in each cage	Aug. 30	Sept. 1	7 a.m.	,,	80	*S. fasciata*	6	2	0	0	0	0	Fairly bright light. Biting very fiercely; all became engorged	0	0	0	0	0	0	Subject, European, on legs. Attempted to bite, but did not pierce the skin

Experiment No. 22. Mixture 10. Soft soap, 1 oz.; paraffin, 20 c.c.; eucalytus oil, 20 c.c.	8 in each cage	Sept. 5	Sept. 6	10 a.m.	Laboratory	83	*S. fasciata*	2	4	1	1	0	0	Bright light. Biting very fiercely; all became engorged	0	0	0	0	0	0	Pierced the skin once, but did not feed
Experiment No. 23. Mixture 10. Soft soap, 1 oz.; paraffin, 20 c.c.; eucalyptus oil, 20 c.c.	12 in each cage	Sept. 5	Sept. 6	11 a.m.	Room with one window	84	*C. fatigans*	0	0	0	0	1	0	Bright light ..	0	0	0	0	0	0	—
Experiment No. 24. Mixture 1. Soft soap, 1 oz.; paraffin, 30 c.c.; bamber oil, 30 c.c.	4 in each cage	Sept. 7	Sept. 8	8 p.m.	Verandah	81	*A. costalis*	0	0	0	0	0	1	Light, two paraffin lamps	0	0	0	0	0	0	Subject, European, on legs
Experiment No. 25. Mixture 1. Soft soap, 1 oz.; paraffin, 30 c.c.; bamber oil, 30 c.c.	4 in each cage	Sept. 7	Sept. 9	7 p.m.	Bedroom	81	,,	1	2	0	1	0	0	Light, two paraffin lamps. Adults bite readily	0	0	0	0	0	0	Subject, European, on legs. Adults do not attempt to bite in this cage
Experiment No. 26. Mixture 10. Soft soap, 1 oz.; paraffin, 20 c.c.; eucalyptus oil, 20 c.c.	6 in each cage	Oct. 1	Oct. 3	2.30 p.m.	Laboratory	83	*S. fasciata*	4	1	0	1	0	0	Light bright ..	0	0	0	0	0	0	—
Experiment No. 27. Mixture 10. Soft soap, 1 oz.; paraffin, 20 c.c.; eucalyptus oil, 20 c.c.	6 in each cage	Oct. 1	Oct. 3	2.30 p.m.	Bedroom	83	*C. fatigans*	0	0	0	2	0	0	Light very subdued	0	0	0	0	0	0	—
Experiment No. 28. Mixture 10. Soft soap, 1 oz.; paraffin oil, 20 c.c.; eucalyptus oil, 20 c.c.	10 in each cage	Oct. 4	Oct. 6	12 noon	Room with one window	85	*S. fasciata*	5	4	1	0	0	0	Light bright. Adults unusually fierce; all those which bit became fully engorged	0	0	0	0	0	0	One or two settled, but did not attempt to bite
Experiment No. 29. Mixture 10. Soft soap, 1 oz.; paraffin, 20 c.c.; eucalyptus oil, 20 c.c.	2 in each cage	Oct. 10	Oct. 11	8 p.m.	Bedroom	83	*A. costalis*	2	0	0	0	0	0	Light, two lamps	0	0	0	0	0	0	Subject, European, on legs

TABLE OF EXPERIMENTS IN DAR-ES-SALAAM, E. AFRICA, SHOWING THE LIFE-CYCLE OF *Culex fatigans* WIEDMANN.

Number of days .. Number of hours..	1 24	2 48	3 72	4 96	5 120	6 144	7 168	8 192	9 216	10 240	11 264	12 288	13 —
Experiment No. 1. Four fully engorged female adults, placed in a cage with a mixture of urine-manure-rain water. Nov. 11, 1918. 12 noon	12 noon. No eggs. All adults alive	9 a.m. Four egg-rafts. All adults alive	9 a.m. Four rafts hatched. One more egg-raft	9 a.m. All larvæ alive, have grown perceptibly	5 p.m. Larvæ very vigorous and growing rapidly	9 a.m. larvæ about three-quarter grown, fewer in number. Perhaps some of the smaller have been eaten	9 a.m. Larvæ almost full grown	9 a.m. A few pupæ	9 a.m. More pupæ	9 a.m. One male adult. Nearly all larvæ have changed to pupæ	9 a.m. Five female adults emerged	9 a.m. Twelve females and four males emerged. Three pupæ left. Some larvæ	9 a.m. Two males emerged. A few larvæ left. Experiment ended
Experiment No. 2. Four fully engorged female adults, placed in a cage with pure rain water. Nov. 11, 1918. 12 noon	12 noon. One small raft of eggs. All adults alive	9 a.m. No more eggs laid. Adults still alive	9 a.m. Two more rafts of eggs. The first raft of eggs has hatched	9 a.m. All eggs hatched	5 p.m. Larvæ have grown, but seem to be feeble	9 a.m. Developing very slowly	9 a.m. Many still alive	9 a.m. Larvæ getting weaker	9 a.m. Only six alive. About half grown	9 a.m. All dead. End of experiment	—	—	—
Experiment No. 3. Four fully engorged female adults, placed in a cage with rain water 70 per cent. and sea water 30 per cent Nov. 11, 1918. 12 noon. Some debris was in the rain water	12 noon. No eggs. All adults alive	9 a.m. One raft of eggs. About 185 eggs in all. All adults alive	9 a.m. None hatched. Three more egg-rafts	9 a.m. Some eggs hatched	5 p.m. All eggs hatched	9 a.m. Some larvæ dead. Remainder rather feeble	9 a.m. Larvæ growing slowly	9 a.m. Some larvæ nearly half grown. Remainder very small	9 a.m. Larvæ still growing. The rate of development very uneven	9 am. Some over half grown. Some still very small	9 a.m. Some larvæ three-quarters grown. Some are fairly active	9 a.m. larvæ much feebler	9 a.m. Larvæ nearly all dead. Experiment ended Nov. 25. None pupated
Experiment No. 4. Four fully engorged female adults, placed in a cage with tap water from town supply. No debris. Nov. 11. 1918. 12 noon	12 noon. No eggs. Adults alive	9 a.m. Four rafts of eggs. Adults all alive. About 200 eggs in each mass	9 a.m. A large number of eggs have hatched	9 a.m. Larvæ are rather feeble	5 p.m. All larvæ are dead. The cause may be due to the composition of the water	—	—	—	—	—	—	—	—

Clinical and other Notes.

DISINFESTATION AT A DISPERSAL CAMP.

By Colonel H. S. THURSTON, C.B., C.M.G., C.B.E.
Army Medical Service.

As it might interest many readers of the Journal of the Royal Army Medical Corps to know what measures, from a medical point of view, were adopted at the dispersal bases in France, for dealing with men on their demobilization, the following is a brief description of a dispersal camp, capable of dealing with 3,000 men arriving daily, and of the disinfestation arrangements, etc., which were in vogue in the camp.

For some months before the Armistice, preparations were made at several of the bases in France to establish special camps to deal with men on their demobilization. These camps, called dispersal camps, were arranged not only for the reception of demobilized men, but for their bathing, the disinfestation of their clothing, etc., and the completion of necessary documents, prior to their dispersal to the various centres in the United Kingdom.

The Dispersal Camp was divided into:—

(*a*) A reception division or "dirty" camp, to which all personnel for demobilization arrive from the detraining station, and

(*b*) Three Despatch Divisions, or "clean" camps, to which men are transferred, after passing through the "dirty" camp, and from which they proceed for embarkation.

Each of these camps was capable of accommodating 3,000 men, the men passing, after bathing and disinfestation at the "dirty" camp, to one of the "clean" camps, to ensure that they were not re-infested.

As the length of stay of a man in the Dispersal Camp was four days, including the days of arrival and departure, the necessity of three "clean" camps will be shown by the following table, in which it is assumed that men begin to arrive on a Monday, and are not embarked until Thursday, and that it was not possible to pass more than 1,000 through the "dirty" camp on the day of arrival.

	Arrivals	Bathed, etc., and passed to clean camp	Remaining at dirty camp	Arrivals at clean camps			Departures	Remaining
				A	B	C		
Monday ..	3,000	1,000	2,000	1,000	..	..	..	1,000
Tuesday ..	3,000	3,000	2,000	3,000	1,000	..	..	4,000
Wednesday ..	3,000	3,000	2,000	3,000	3,000	1,000	..	7,000
Thursday ..	3,000	3,000	2,000	1,000	3,000	3,000	3,000	7,000
Friday ..	3,000	3,000	2,000	3,000	1,000	3,000	3,000	7,000

It will be noted that with the arrival of 3,000 men daily, there will not be less than 2,000 in the "dirty" camp, or more than 7,000 in the "clean" camp, if the embarkation is working smoothly.

At the Reception Division, a disinfestation station was established at which

the man was bathed, and his uniform disinfested, and where he was issued with clean underclothing. This service was largely a medical one, as it was essential that precautions should be taken to eusure that every man proceeded home "vermin-free" to prevent his conveying lice-borne fever to those at home.

To carry out the bathing and disinfestation of several thousand men per day was a big undertaking. At first, a scheme was drawn up, providing for this by means of Manlove and Alliott's disinfectors. The scheme was designed to disinfect the whole of the man's kit and equipment, as well as his underclothing and the towels used, and to bath the men in parties of fifty every ten minutes. This scheme was not adopted, however, being replaced by a general scheme made applicable to all Bases, which included hot air disinfestation by means of a chamber designed by Major Orr, Canadian Army Medical Corps, a description of which is given later.

General Scheme.

Attached is a plan of the Bathing and General Disinfestation Station at the Reception Camp. This station was planned to deal with 3,000 men per day by means of four delousing plants. The medical arrangements were under a senior officer, who had at his disposal ten medical officers. Sufficient sanitary personnel, under a sanitary officer, was also posted to the camp. The duty of the medical officers in the camp was to examine every man passing through so as to give him a vermin-free certificate. Anyone suffering from skin or other complaints requiring immediate treatment was detained and sent to hospital to receive such treatment before being allowed to proceed to England.

In order to avoid any unnecessary exposure of the men during the process of disinfestation, medical inspection, and bathing, and in view of the fact that the bath-houses and annexes were merely corrugated iron structures, and therefore extremely cold, the following additional measures were taken, and the original plan was modified accordingly:—

(1) The entrance passage leading to the undressing room was fitted with double doors, the inner one being provided with a blanket screen to keep out draughts:—

(2) A large stove was placed at the end of the passage at the junction of the exit from the undressing room into the medical inspection room, two large stoves in the drying room, and three in both dressing and undressing rooms.

(3) The medical inspection room, enclosed with wooden partitions extending to the roof, was lighted by a skylight, and the room in which the clerks and barbers worked was arranged so as to open out of it.

(4) Lateral walls were built running from the disinfestation chamber to the main building, so as to prevent cold air blowing under or through the main doors.

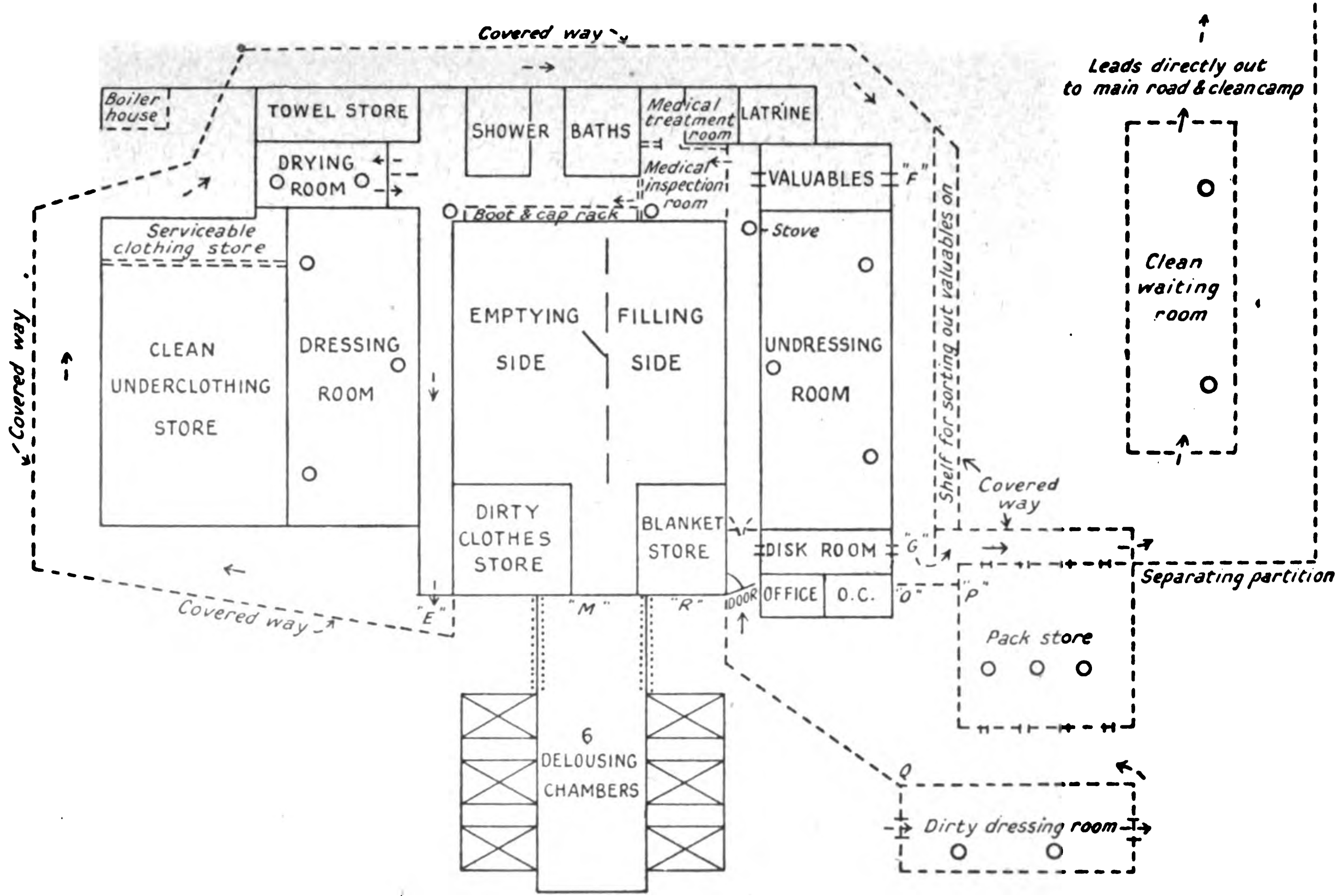
(5) The walls of all partitions round the central hall and those of the drying room were carried up to the roof, so as to keep the building warm by excluding cold air from the different rooms.

(6) A covered way was built round the outside of the main building so as to protect the men from the weather on their exit and during their progress to the "valuables" room, disk room, and pack store.

(7) The main building was heated by additional stoves.

These additions to the original plan proved very effective in preventing the

Diagram of Central Delousing and Bathing Station, St. Martin's Camp, Boulogne Base, as actually functioning February, 1919.



Note.—Dotted lines indicate corrugated iron walls. O = Stoves.

men from being unduly exposed to cold, and were mainly responsible for the fact that no serious illness could in any way be attributed to exposure during their demobilization.

Method of Procedure for Disinfestation and Bathing.

The men are dealt with in parties of 200, fully clothed and equipped, and in order to hasten the process inside the building, each party unlaces their boots and remove their putties whilst waiting in the "dirty" waiting room.

(1) They leave their rifles and equipment in the pack store hut outside the main building, and in exchange receive a numbered disk, a second disk with the same number being attached to the equipment. With the first disk round their necks, they pass to the entrance of the main building where they receive from the issuing window in the disk room (*a*) a "valuable" bag with numbered disk, and (*b*) another disk for attachment to their coat-hooks, these disks bearing the same number as the disk they receive at the pack store; they then proceed to the undressing room, which has numbered seats. Each man proceeds to the seat corresponding to the number on his disk, and there finds a coat-hook. He then places his valuables, watch, etc., in his "valuable" bag and ties the other disk securely to the coat-hook. He then hangs his service dress on to the coat-hook, his dirty underclothing being collected and taken to the dirty clothing store. Coats and trousers are turned inside out before being hung on the coat hangers, so as to expose the seams.

(2) The coat-hooks bearing each man's service dress clothing are then sent on trollies to the disinfector. As stated above, the disinfestation plant was designed by Major Orr, C.A.M.C. It consists of six chambers, into which the clothing trucks are run on rails; each chamber has a definite capacity and is divided into:—

(*a*) The stoking room, which is below ground, and measures at its roof 14 feet 4 inches by 7 feet 6 inches, at its floor level 10 feet by 5 feet 2 inches, and is 5 feet in height. The floor of the stoking room is of cement, on which are placed two braziers.

(*b*) The delousing chamber, which measures 15 feet by 8 feet 2 inches and is 5 feet 8 inches in height. Each delousing chamber has six 4-inch outlet pipes, and two stoking chambers have one 8-inch by 4-inch inlet pipe under each brazier. The floor of the delousing chamber is made of corrugated iron, perforated by 128 holes measuring 6 inches by 3 inches, and supports the rails on which the truck runs. Thirty-two service dress suits can be placed on each clothing truck and disinfested. With properly fitting doors, the heat attained ensures the thorough disinfestation of all garments in a few minutes. The average time for the clothes to remain in this chamber is twenty minutes, which is more than sufficient.

(3) Each man then proceeds along the corridor to the valuables receiving hatch, where the canvas valuables bags are handed in.

(4) They then enter the medical inspection room situated next to the bathroom, and the men are thoroughly examined by expert medical officers. Men suffering from either venereal or skin diseases are allowed to proceed with their bathing, but their names and "valuable" disks are taken, so that they may be collected

afterwards and dispatched to hospital. To ensure complete freedom from vermin a large number of the men have been shaved (but of course this may somewhat delay the delousing, and calls for a large number of expert barbers who are not always available). The shaving is not compulsory, but few men when found to have nits are averse to it; this becomes a large service when one takes into consideration the fact that at least twenty-five per cent of the men are found to have nits.

(5) After medical inspection, the men deposit their caps, leggings and boots, in special racks, and take their places under the shower baths.

(6) After the bath, the men proceed to the towel issuing store, and having received a clean towel enter the drying room.

(7) On leaving the drying room, a medical orderly sees that all men who have been shaved are given an ointment of twenty-five per cent hyd. ammon. to apply to the affected parts. The men then take their caps and boots and proceed to the dressing room.

(8) On reaching the dressing room, each man occupies the seat bearing his number, and draws from the nearest window of the clothing store a clean suit of underclothing, consisting of shirt, vest, pants and socks. He then waits until the attendant brings him his coat-hook bearing his garments which have passed through the disinfestation chamber.

(9) On completing their toilet, the men pass out of the building, leaving their coat-hooks above their seats, so that they may be collected by the attendant, and hand in their dirty towels as they pass the dirty towel store.

(10) On leaving the building, the men carry with them their equipment disks hung around their necks, and their clothing disks, and proceed round the building under the covered way to the issuing hatch of the valuable room, where on showing their equipment disks the valuables bags with attached disks of the same number are returned to them.

(11) The men then sort out and replace their valuables in their pockets, and hand in their clothing disks and valuables bags at the receiving window of the disk room.

(12) The party then receive their rifles and equipment in exchange for the equipment disks, and are marched off to the dispatch division.

This scheme has been found to work excellently, for as soon as the attendants know their duties, perfect order is ensured, and a continual stream of men can pass without confusion.

In order to ensure that every man had passed through the disinfestation station, at the commencement of demobilization a second medical inspection was carried out at the "clean" camp before vermin and scabies-free certificates were given, but as practically no men were found verminous, this inspection was discontinued.

In the above scheme no provision is made for the disinfestation of the spare underclothing in the packs of men passing through; this matter was discussed, but at first it was found very difficult to treat such clothing or to issue clean clothing in lieu. Orders were therefore issued to ensure that no such underclothing remained in the possession of the men. Later, when the arrangements were working smoothly, articles of clothing carried in the packs were

replaced by clean ones, and by this means the possibility of reinfestation was removed.

The above is a brief description of the medical arrangements to deal with men demobilized at a base, and although a few complaints came from England, stating that occasionally some men were found to arrive in a verminous condition, it is not certain that these men had passed through the central disinfestation station. Considering the large numbers passing through daily, it is, of course, quite impossible to guarantee that everyone is vermin-free, but there is no doubt that the above scheme has worked most efficiently and successfully. The two main factors in obtaining satisfactory results are (*a*) a thorough medical inspection and treatment, and (*b*) the maintenance of a sufficiently high temperature in the disinfestation chamber. If these are properly attended to, it can be assured that each man is clean, and his service dress thoroughly vermin-free.

IMMEDIATE SUTURE OF THE ULNAR NERVE AND DELAYED SUTURE OF THE ELBOW JOINT.

By Major H. E. RAWLENCE.
Royal Army Medical Corps.

This patient was admitted to the Surgical Division (Alexandra Hospital, Cosham), on April 29, 1918, in the forenoon. The field medical card contained the following statement:—

"Large foul wound of elbow, involving left humerus and ulna. Ulnar nerve cut. Wound excised and cleaned, comminuted olecranon removed. Divided ends of ulnar nerve brought together by holding suture. Iodoform paraffin dressing. Interrupted elbow splint. (Signed) R. Brown, Captain, R.A.M.C., April 25, 1918.

Personal History: In front of Amiens his unit was advancing when a "whiz-bang" shell exploded just behind him, followed by loss of power in the arm, which fell to his side. He had a sickening, stinging pain. Operation in 45th Casualty Clearing Station the same day, about four hours later.

On arrival here the wound was examined. The whole posterior surface of the elbow joint was exposed. There was some discharge which, when removed, showed a fairly healthy muscle surface, some pus along the fascial planes. The joint surfaces were separated by iodoform paraffin pack, the splint was an interrupted Esmarch, and the joint was at a right angle. The fractured stump of the olecranon was visible in the wound, also the exposed and guttered posterior surface of the humerus. On examination the gauze could not be removed from between the joint surfaces without a general anæsthetic. As a result the wound was washed with C.D. fluid, dried and B.I.P.'ed and the splint reapplied.

April 30, 1918: Robert Jones shoulder splint prepared, and with the assistance of Captain G. E. Thornton, R.A.M.C., general anæsthetic was given. The whole surfaces were cleaned up, washed with C.D. fluid, swabbed with Harrington's solution, dried and B.I.P.'ed.

(1) The synovial membrane was brought together and sutured where possible.

(2) The tendon of the triceps was released on the deep surface from the

muscle, and brought down and sutured with catgut to the periosteum over the ulna and the capsule at the back of the head of the radius.

(3) The remains of the anconeus were brought up over this suture line and interrupted suture united it to the superficial surface of the triceps tendon.

(4) The suture of floss silk in either end of the ulnar nerve was visible. The suture was removed, the nerve ends were in good apposition and a flap of muscle was brought over the cut nerve ends from the internal condyle.

(5) The skin was sutured transversely. The arm was put up in the splint in extension.

May 6, 1918: The wound was progressing satisfactorily, healing by first intention. No pain and no fever after first twenty-four hours. 10th: All stitches were removed. The wound was healed. The left arm was put on an ordinary internal angular elbow splint. The patient was sent to Captain Thornton, R.A.M.C., for electric treatment and massage. 15th: Passive movements started. 28th: Patient stated this morning that last night the movements of hand and little finger, which were impossible since the injury, had returned. The electro-therapeutic officer reports that galvanic reaction has always been brisk. 27th: Slight but distinct faradic response in muscles of hypothenar eminence was noted. 28th: Weak but still good movements of intrinsics of hand by faradism, and also voluntary movement.

This case is of interest as being, firstly, a case of delayed primary suture of a joint, and secondly a case of immediate suture of the ulnar nerve, i.e., within four hours of the time of injury.

This case was watched with great interest by the hospital staff. I am glad to say that we have tried the same treatment in two other cases, with equally good effect and result. In my opinion it is a mere matter of technique and experience to obtain in joints the results which we now expect and get in peritoneal cases. The synovial and peritoneal membranes have so much in common that there is no need to enlarge upon the subject. The great difference between the two lies in the inability to treat a knee or other joint in the equivalent of the Fowler position, and one must therefore resort to trocar and canula, irrigation and washing out being the technique after suture, where sepsis is present or suspected. The synovial fluid is *the* medium for bacterial growth a short time after exuded; freshly exuded it no doubt contains antibodies and is probably bacteriolytic and anti-toxic, though I have been unable to find literature to confirm this statement.

With regard to the ulnar nerve, every surgeon is aware of the resistance of nerve tissue to sepsis. Surgeons should be prepared to lay the nerve exposed in a wound end to end. If sepsis does occur the patient is no worse off, the nerve will not slough, and some such recovery as recorded here may be expected. This obviates the secondary suture of the nerve and consequent months of treatment.

As a result of seeing this case and another of immediate median nerve suture, I am quite convinced that nerves may unite by primary union, and recover in a way quite different from that with which many of us are familiar in secondary nerve suture.

A CASE OF DOUBLE CONGENITAL TALIPES VARUS.

By Captain W. E. TANNER.
Royal Army Medical Corps.
Surgical Specialist, the Military Hospital, Gibraltar.

E. R., aged 4 years and 7 months, son of a corporal in the Royal Garrison Artillery, was seen at the Military Hospital, Gibraltar, in June, 1918. His mother stated that both feet had been deformed since birth, and that they were bandaged for forty days after birth without any change being noticed in them. His mother also said that about three years ago tendons had been cut, and plaster of Paris splints had been applied to both feet. These were removed at the end of three months, but deformity was not materially altered. Arrangements were made for the mother and child to live near the hospital, so that the child could attend regularly for treatment after the operation.

Figs. 1 and 2 show the condition of the feet before operation.

On July 2, 1918, the left foot was operated on. The tendon of the tibialis posticus was divided through a vertical incision just above the internal malleolus, the plantar fascia and ligaments beneath the medio-tarsal joint were divided with tenotomes. An elliptical incision was then made on the front and outer side of the foot, commencing just below and internal to the middle of the front of the ankle and passing downwards, forwards, and outwards to the outer border of the foot. The head of the astragalus was exposed and removed with bone forceps, the section being made obliquely from without inwards and forwards. The os calcis and cuboid were exposed through a longitudinal incision on the outer side of the foot, the calcaneo-cuboid joint was opened, and the posterior part of the cuboid was removed. The foot was held in the corrected position, whilst the tibialis anticus was sewn to the ligaments and periosteum on the dorsal aspect of the cuboid, and the ligaments on the dorsum of the astragalus and scaphoid were shortened by means of catgut sutures. The wound was closed, dressings were applied, and the leg and foot fixed in a back-splint and foot-piece, with a side-piece fixed to the inner side of the leg and foot. The wound healed primarily.

On July 30, 1918, the right foot was operated on. The operation was similar to that done on the left foot, except that a wedge-shaped piece of the os calcis was removed instead of the posterior part of the cuboid, and that the tibialis posticus was not sutured to the dorsal aspect of the cuboid. The wound healed primarily.

Massage and exercises were commenced as soon as the wounds had healed.

On November 19, 1918, the boy walked in a pair of Salt's patent varus boots. Figs. 3 and 4 show the condition of the feet after operation.

I am indebted to Sapper Lefts, R.E., for the photographs.

A CASE OF STRANGULATED HERNIA WITH VOLVULUS.

By Major BASIL HUGHES, D.S.O.
Royal Army Medical Corps (T.F.).

W.R./275483 Spr. S. was admitted to 39 Stationary Hospital January 14, 1919, suffering from a left-sided strangulated inguinal hernia.

He gave the following history: He had suffered from a small left-sided hernia for some months. The day before admission to hospital, after a bout of coughing, the hernia came right down into the scrotum, causing pain and vomiting.

FIG. 1.—Condition before operation.

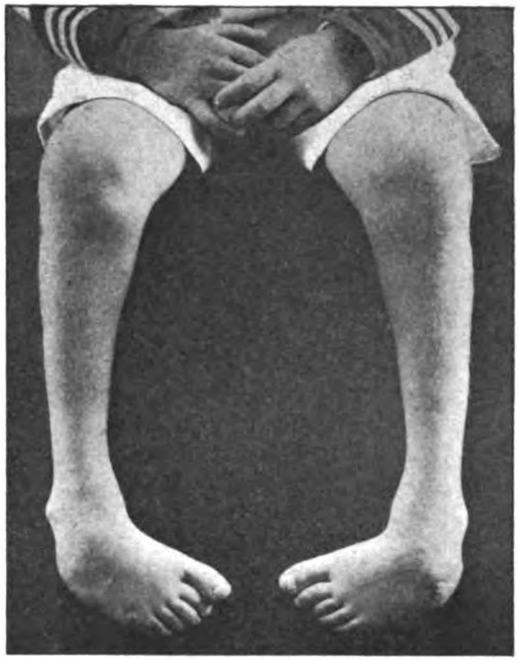


FIG. 2.—Shows prominence caused by head of astragalus and left foot shows thickening of the skin on outer side of the tarsus.

FIG. 3.—Shows condition of feet after operation. Photograph taken on November 27, 1918.

FIG. 4.—Shows condition of feet after operation. Photograph taken on November 27, 1918.

Condition on Admission.—Patient vomiting a brownish inoffensive fluid, he did not seem particularly distressed and he did not show an abdominal facies. His temperature was 90° F. and pulse 66, good, regular and steady. He had passed neither flatus nor fæces since the previous day.

The abdomen was distended, not particularly tender, but he complained of some pain in the epigastric region. No visible peristalsis was observed.

There was a large tender tumour occupying the left inguinal canal and the left-side of the scrotum, and the skin of the scrotum at one spot was red and tender. There was no impulse in the mass on coughing, there was definite fluctuation and the tumour was resonant to percussion.

Operation.—The usual incision for the radical cure of hernia was made but continued a little way on to the distended scrotum. On opening the sac a quantity of blood-stained and very foul fluid escaped. A large gangrenous mass of omentum clothing a loop of gangrenous large intestine was present. The internal abdominal ring was next enlarged and both bowel and omentum pulled down until healthy tissue was reached. It was then found that the bowel was twisted on itself at the internal ring and that a true volvulus existed. Healthy bowel was pulled down with difficulty. The gangrenous omentum was removed and the gangrenous bowel resected, end-to-end anastomosis being performed. This done the anastomosed bowel was returned and the radical cure of the hernia was completed, a small glove drain being left under the skin owing to the infected condition of the contents of the sac. The abdomen was then opened by a left pararectal incision, as one was not wholly satisfied as to what was the true state of affairs. It was then ascertained that the portion of the bowel dealt with was the pelvic colon, that the anastomosis was satisfactory, but there was fluid present in the peritoneal cavity; the fluid was blood-stained but inoffensive. No peritoneal drain was employed.

Curiously enough the wounds healed by first intention, though the inguinal wound was red and looked like suppurating forty-eight hours after the operation. The glove drain was removed at the end of forty-eight hours and the stitches on the tenth day. The bowels moved on the fourth day and the patient made an uninterrupted recovery.

The case is of interest—

(1) The condition of volvulus occurring in a hernial sac is rare.

(2) The symptoms were remarkably mild considering the condition that existed.

(3) The patient gave no trouble during convalescence and the wound healed *per primam* despite the offensive nature of the sac contents.

Lecture.

GAS POISONING IN WARFARE: THE TASK OF THE MEDICAL SERVICE.[1]

By C. G. DOUGLAS, C.M.G., M.C., D.M.

I WISH to direct your attention to-day to a consideration of certain problems connected with gas warfare which have to be faced by the medical services. I do not intend to deal in detail with the symptoms or the treatment of the individual case of gas poisoning, for I have no doubt that you are personally well acquainted with that aspect of the question; moreover, the information on this point has been summarized in pamphlets issued during the war, and has formed the subject of some of the lectures already given at this college.[2] What I want to do is to try and give you some idea as to what gas warfare really means to the forces in the field, and I am going to base my argument mainly on the number of the gas casualties that we experienced during the war, on the general character of those casualties and on their after-history.

For this purpose we may conveniently divide gas warfare as we experienced it at the hands of the Germans into the following stages:—

Period	Method of discharging gas	Gas used
April and May, 1915 (six attacks)	Cylinders	Chlorine.
April, 1915 to July, 1916	Gas shell	Simple lachrymators, e.g., xylyl bromide.
December, 1915, to August, 1916 (five attacks)	Cylinders	Chlorine and phosgene.
July, 1916, to July, 1917	Gas shell	Phosgene, diphosgene, chloropicrin, simple lachrymators.
July, 1917, to end of war	Gas shell	*Yellow cross:* mustard gas. *Green cross:* phosgene, diphosgene, chloropicrin, with in some cases chlorarsines. *Blue cross:* chlorarsines + large high explosive charge.
December, 1917, to May, 1918 (sixteen bombardments)	Projectors	Phosgene.

Without detailing the whole of the different gases which were used from time to time by the Germans, we may classify them broadly as regards their action on man into four groups, viz:—

(1) Acute lung irritants, such as chlorine, phosgene, diphosgene and chloropicrin, which cause, when breathed in sufficient concentration, the rapid onset of acute pulmonary œdema, death being due to interference with the respiratory function of the lungs owing to the accumulation of fluid and injury to the pulmonary alveoli.

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[1] A lecture delivered at the Royal Army Medical College, April 14, 1920.

[2] Medical Research Committee: Reports of the Chemical Warfare Medical Committee, Nos. 1 to 15. Haldane: JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, xxxiii, p. 494, 1919. Barcroft: *ibid* xxxiv, p. 155, 1920.

(2) Simple lachrymators, such as xylyl bromide, which in low concentration lead to intense smarting and watering of the eyes, and on this account interfere with a man's fighting efficiency.

(3) Vesicants, such as mustard gas (dichlorethyl sulphide), which in low concentration causes intense conjunctivitis, chemical scorching and blistering of the skin, and severe injury and destruction of the mucous membrane of the trachea and bronchial tubes; death, when it occurs, being due almost invariably to secondary infection of the damaged and necrotic mucous membrane of the air passages with bacteria and the subsequent development of severe broncho-pneumonia.

(4) Sensory irritants, such as the chlorarsines (diphenylchlorarsine, ethyl-dichlorarsine) which in minute concentration cause sneezing, intense burning and aching pain in the nose, mouth, throat and chest, smarting and watering of the eyes, nausea and great mental depression.

As a serious cause of casualties we may at once dismiss the simple lachrymators. When first they were used they had a considerable value as harassing or neutralizing agents, but owing to their high boiling point (xylyl bromide, for instance, boils at 185° C.) it proved impossible to obtain a high enough concentration of the vapour in the air to cause any material effects on the lungs or elsewhere in the body, whilst the slight conjunctivitis and intense lachrymation to which they gave rise passed off rapidly on withdrawing from the poisonous atmosphere. The number of men affected by lachrymators who actually reached medical units as casualties was quite small, and they were practically all returned to duty again in a couple of days: there were no deaths, save possibly in a few cases when lachrymator shell may have burst inside an occupied billet or shelter. It may be noted that gas shell containing lachrymator substances were discarded both by ourselves and by the Germans in the later period of the war when the progressive development of gas warfare led to the substitution of other chemical shell for the purpose of obtaining a harassing or neutralizing effect, so as to avoid the tactical disadvantages resulting from the high boiling point of the lachrymators and the consequent long persistency of these toxic liquids on the ground. The largest group of casualties resulting from lachrymator shell probably occurred during the battle of Loos, when some 550 cases were admitted to medical units.

Let us turn now to the effects produced by the acute lung irritant gases. You all know the story of the initial gas attacks made by the Germans between Langemarck and Hill 60 during April and May, 1915, Chlorine appears to have been the gas used, and it was liberated from cylinders installed in the German front line and was carried by the wind as a thick cloud upon the positions held by the French and ourselves. Great numbers of casualties were caused with a high death rate, but this is not to be wondered at, seeing that this new type of warfare came as a complete surprise, and our troops were consequently unprovided with respirators or other means of defence against the gas. Statistics as regards casualties are, I am afraid, unreliable in this instance, though there is evidence that some 7,000 gas casualties were admitted to our medical units. Many men were killed outright on the field by gas, but there are no precise data as to the number, whilst our casualty lists indicate that not less than 350 deaths occurred amongst

the gas casualties admitted to medical units. There is no need to dwell on the results of these early attacks, for, as I have said, our troops were quite unprotected, and it is of much greater importance to consider what happened in the later cloud gas attacks when defensive measures against gas had been evolved and the troops had been equipped with an efficient respirator.

Between December 19, 1915, and August 8, 1916, the Germans made five cloud gas attacks against us on the Wieltje, Hulluch, or Wulverghem Fronts. Instead of discharging the gas from cylinders at a comparatively slow rate, as had been the practice in the earlier attacks, they now released the gas in a limited time so as to attain the highest possible concentration of gas in the cloud, whilst they increased the toxicity of the cloud still further by mixing phosgene with the chlorine. What they were aiming at was clearly to surprise our troops with a lethal concentration of gas before they could protect themselves with their respirators.

The casualties that we suffered in these attacks were as follows :—

Total gas casualties resulting from cloud attacks between December 19, 1915, and August 8, 1916	4,207
Total deaths	1,013
Deaths per 100 casualties	24·0 per cent,

It speaks well for the general high standard of anti-gas discipline that the number of gas casualties was no larger, for an average of 850 casualties in each attack cannot be considered excessive when one considers the great number of men who must have been exposed to the cloud, seeing that gas was liberated all along sectors which varied in length in the different attacks from 1,700 to 4,400 yards, whilst in some of the attacks a dangerous concentration of the gas penetrated to a depth of 10,000 yards behind our front line.

How large a part is played by the element of surprise in these cloud gas attacks is well indicated by the fact that the great bulk of the casualties occurred in the front system of trenches, just where there is least opportunity to spread the warning in time for men to get on their respirators before the gas cloud is upon them. Thus in one of the attacks four battalions of one of the divisions actually holding the line suffered 320 gas casualties, and of these 232 occurred at points between 50 and 500 yards from the enemy, 185 taking place in the actual fire trenches. This is further borne out by considering where the deaths given in the table above occurred. These points were as follows :

	Number	Percentage of total deaths
In the trenches	485 ..	47·8
In field ambulances	175 ..	17·3
In casualty clearing stations	320 ..	31·6
In hospitals on lines of communications ..	33[1] ..	3·3

You will see that nearly half the deaths occurred before the casualties could be admitted to a medical unit.

Though, no doubt, the number of casualties is not excessive if we compare it

[1] Note that twenty-eight of these deaths at hospitals on the lines of communication occurred as a result of the gas attack of December 19, 1915, before it was recognized that early evacuation of the cases to the base was prejudicial.

with the number of men actually involved in the attack, you must remember that these casualties are all caused within the space of a few minutes, and you will then get a better idea of the task that confronts the medical services in attacks of this nature. The number of casualties to be evacuated throws a great and sudden strain on stretcher bearers and on field ambulance units responsible for clearing the sector. The mortality figures in themselves are quite enough to show you that a large proportion of serious cases have to be dealt with. Even in the absence of further enemy activity the problem of rapid evacuation is difficult enough, and the difficulty is still further increased by the nature of the cases. What you have to fear is the onset of acute pulmonary œdema. If the case has been exposed to a heavy concentration of gas this œdema may come on at once, but as you know—and this is particularly the case in poisoning with phosgene or nitrous fumes—the onset of acute œdema may be delayed for an hour or two, the case very likely showing but trifling symptoms in the interval. When once œdema manifests itself it develops rapidly, and in quite a short time the case may be in the gravest condition. There is one thing in particular that will accelerate the onset of œdema and aggravate the symptoms when œdema is established, and that is muscular exertion, and it was for this reason that stringent rules were laid down in France enjoining that all casualties caused by the acute lung irritant gases, save the lightest cases, were to be evacuated lying down, so far as it was possible to do so.

In fatal cases of poisoning with chlorine or phosgene death in nearly every case occurs within the first forty-eight hours after exposure to gas, in fact more that eighty per cent. of the deaths may take place within the first twenty-four hours. The immediate aim of treatment must be therefore to tide the case over the initial critical period, and this implies that every effort must be made to get the casualties as quickly as possible to some place where effective treatment can be practised. The main essentials in treatment are complete rest, continuous oxygen administration, and in appropriate cases venesection, and the casualties require constant attention and nursing in the critical period. In France we found that as a rule the best plan was to get the cases back to the casualty clearing stations for treatment, but sometimes field ambulances were so fortunately situated as to have facilities for the effective treatment of these cases, and the distance that the casualty had to be transported by ambulance car could then be somewhat curtailed. Had suitable apparatus been available it would have been a good thing to have kept up oxygen administration to the bad cases during transportation.

You will see that it is no easy task to deal successfully with a large batch of severe gas casualties resulting from a cloud gas attack. Evacuation may be interfered with by shell fire, and perhaps have to be delayed till nightfall owing to the sector affected being under enemy observation during the day. Moreover accommodation in the medical units may be already strained owing to a heavy influx of other battle casualties. The British, however, were not the only ones who had to try and meet these difficulties. The Germans had a bitter experience of the effects of chlorine and phosgene, for when we had developed our own organization for the offensive use of gas our special companies carried out numerous cloud and projector attacks with these gases, and the following passages quoted from German instructions regarding the diagnosis and treatment

of gas poisoning, which were published in May, 1918, lend emphasis to what I have already said.

"Definite cases of gas poisoning are harmed by any form of transport, since this leads to unavoidable muscular exertion. . . . On the other hand, the choice of the time for transport is often determined by military considerations, and the ultimate fate of the casualty depends on appropriate treatment and, above all, on trained nursing, which is best afforded in the gas station of a permanent hospital. An attempt should therefore be made to transfer the case from the medical dug-out to a gas station within an hour or two of being gassed. If the case is only taken as far as the main dressing station a decision has to be made whether further transport or the lack of efficient nursing constitutes the greater danger. . . . The value of a gas casualty station in an army field hospital rests on the fact that experienced medical officers, detailed organization of the hospital, and, in particular, a thoroughly trained male and female nursing staff alone render it possible to do justice to individual gas cases and to attain favourable results, especially when there is a great influx of cases."

Projector discharges caused results which were in the main similar to those produced by cloud gas attacks, though the total casualties resulting from any one discharge were much smaller owing to the more limited area affected by the attack. This method of gas attack was British in development, and consists in the simultaneous discharge on to a selected target of a large number of heavy bombs filled with liquid phosgene from trench mortars of simple type. The Germans made but little use of this method, and their sixteen projector attacks between December, 1917, and May, 1918, only caused us 444 casualties, of whom 81 died, the death-rate being 18·2 per 100 casualties. These figures, however, hardly give a fair picture of the possibilities of this mode of warfare. Our own projector bombs held twice as much gas as those of the Germans, and that our methods were effective is well shown in the case of one of our projector attacks as a result of which we caused the enemy 119 gas casualties, of whom fifty-three died, and this in spite of the fact that the installation of gas had been suspected and the troops had been specially warned to be on the alert. You can well understand a result like this when you think how well adapted this method is for surprising the enemy with a very heavy concentration of gas.

After August 8, 1916, the Germans never made another cloud gas attack upon us, though they continued to use this method on other parts of the Western Front up to July, 1917. Very likely they were deterred from doing this by the fact that they could only count on a favourable wind for a brief period in the spring, as well as by our raiding activity and the heavy character of the fighting. On July 15, 1916, shortly after the first battle of the Somme commenced, they introduced shell containing acute lung irritant substances, and the employment of shell and trench mortar bombs containing such substances as phosgene, diphosgene and chloropicrin rapidly became extensive.

Between July 15, 1916, and July 12, 1917, the number of casualties caused by these shell who were admitted to medical units was as follows:—

Total gas shell casualties, July 15, 1916, to July 12, 1917	8,806
Total deaths	532
Deaths per 100 casualties	6·0

When you consider that this period embraces the battles of the Somme, Arras and Messines you will recognize that the gas shell casualties formed but a trifling fraction of our total battle casualties. The comparatively small number of casualties, and the lowness of the mortality in spite of the great number of gas shell used, owes its explanation to the fact that it is difficult by this method to attain a sufficient concentration of acute lung irritant gases to be really effective before the troops exposed to the shelling have got on their respirators or gained protection in dug-outs, and in agreement with this one may note that in many instances the only severe casualties resulting from these bombardments occurred right at the commencement of the shelling when men were caught unawares by shell bursting close to them before they had time to appreciate the nature of the bombardment. The method cannot therefore be regarded as of great value for producing casualties, however great may be its harassing or neutralizing power. The problem of handling the casualties was evidently far easier in this case than after a cloud gas or projector attack, the more so as the gas shell bombardments were frequently directed on targets behind the trench system, such as batteries, roads or billets, from which places rapid evacuation of the gas casualties to medical units was as a rule a simpler problem than evacuation from the trenches.

With the introduction of two new types of gas shell on July 13, 1917, we reached the culmination of the German methods of offensive gas warfare. From this date until the end of the war three kinds of gas shell, distinguished from one another by the characteristic identification marks painted on the shell, were employed by the Germans in enormous numbers. These shell were: (*a*) Yellow cross shell, containing dichlorethyl sulphide or mustard gas, (*b*) green cross shell, containing acute lung irritant substances, (*c*) blue cross shell, containing toxic chlorarsine compounds in addition to a heavy high explosive charge.

During the period July 13, 1917, to the end of the war we suffered the following gas shell casualties:—

Total gas shell casualties, July 13, 1917, to end of war ..	160,526
Total deaths	4,086[1]
Deaths per 100 casualties	2·5[1]

Here we get an astounding change in the results produced by gas warfare. The number of gas casualties has become enormous, though the mortality amongst these casualties is surprisingly low. Gas in fact accounted during this period for some fourteen per cent of our total battle casualties. The change is to be attributed practically entirely to the introduction of mustard gas, for this poison was responsible for not less than eighty per cent of our total gas casualties during this period. In support of this statement let me quote the experience of two medical units, the one a corps gas centre, the other a hospital at one of the bases. Between May 25 and October 9, 1918, the corps gas centre admitted 3,510 gas casualties: of these 83·4 per cent were caused by mustard gas, 9·6 per cent by blue cross, and 7·0 per cent by green cross. The hospital at the base admitted

[1] Exclusive of the small proportion of deaths that occurred amongst the casualties after evacuation to England.

894 gas casualties between May 1 and August 31, 1918, and of these 77 per cent were ascribed to mustard gas, 10 per cent to blue cross, 6 per cent to green cross, 4 per cent to lachrymatory gases, the remaining 3 per cent not being defined.

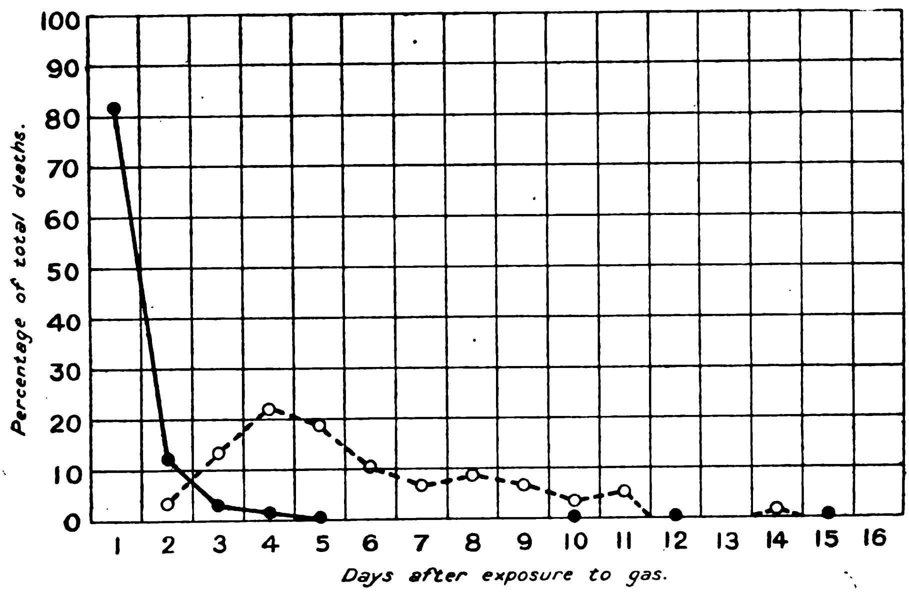
The great number of the casualties is easily accounted for by a consideration of the properties of mustard gas. Its action is insidious, for it has little smell and causes no immediate sensory irritation of the eyes or respiratory passages, the onset of inflammatory changes in the eyes, skin and respiratory passages being delayed as a rule for an hour or two and coming on gradually. At the same time it is intensely toxic in very low concentrations, and as the boiling point of the liquid is 217° C. ground which has been shelled continues to yield a dangerous concentration of the vapour for days. The high boiling point and slow vaporization of the liquid have, however, one advantage, for it means that some time is required for a man to absorb enough of the poison to be affected dangerously, and there is therefore a reasonable probability that he will have withdrawn from the dangerous area or protected himself before this happens, even if he has unwittingly entered an area contaminated with mustard gas owing to previous shelling. Remember, however, that the standard of anti-gas discipline was high throughout the whole of the mustard gas period; had it not been for this the picture would have been very different. To emphasize this I need only quote one purely local instance when anti-gas precautions were grossly neglected both during and after a mustard gas bombardment; nearly fifty per cent of the casualties caused on this occasion died. You need no better example to show you how much depends on good defensive organization against gas.

When one is dealing with the acute lung irritant gases one is apt to gauge the effectiveness of the weapon in terms of its killing power, owing to the large proportion of severe casualties and the high death-rate that are liable to occur. We must evidently regard mustard gas in a different light. In this case the value of the poison lies in its casualty producing power, for its killing power cannot be reckoned great amongst troops well skilled in defence against gas. The principal difficulty that confronts the medical services is therefore the question of handling this great number of casualties.

Owing to the slow onset of the symptoms after exposure to the gas, the problem of evacuation is a good deal simpler than in the case of poisoning with the acute lung irritants, and cases can safely be transported to a far greater distance behind the line than is advisable when acute pulmonary œdema is likely to supervene. Moreover, there is no necessity to lay such stress on the importance of evacuating the casualties as lying cases: in fact the great majority of the casualties can in practice be regarded as walking cases, at least in the earlier stages when their vision is not seriously interfered with by the conjunctivitis. On the other hand, there are some troublesome features in the treatment of mustard gas casualties that throw a good deal of additional work on the medical units, especially in the forward area. It is imperative that clothing contaminated with mustard gas should be replaced and disposed of at the earliest possible moment, lest a mild case should be transformed into a grave one owing to continued absorption of the poison; and arrangements have to be made to bathe the cases at the same time. At a somewhat later stage when conjunctivitis has developed, frequent irrigation of the eyes is necessary till the acute inflamma-

tion begins to subside, and steps must be taken to minimize the risk of septic infection of any burnt or blistered areas of the skin, both of which measures mean a good deal of attention on the part of the nursing staff.

It is only in rare cases that the damage caused by mustard gas is in itself sufficient to cause death. A fatal issue is almost always determined by secondary infection with micro-organisms of the necrotic mucous membrane of the trachea and bronchial tubes. Bronchopneumonia caused in this way takes time to develop, and the subsequent fate of the patient depends on the virulence of the infection and on his own powers of resistance, but when once bronchopneumonia supervenes the outlook for the case must be regarded as serious. The deaths therefore are not crowded into the first couple of days after exposure to gas, as is the case in chlorine or phosgene poisoning: they do not begin until twenty-four to thirty-six hours have elapsed after exposure, and continue to occur for many days, and sometimes in fact weeks, though the majority of deaths take place within the first ten days. The accompanying figure shows very clearly the difference between chlorine or phosgene poisoning and mustard gas poisoning in this respect.



——— = deaths from chlorine and phosgene.
- - - - = deaths from mustard gas.

The curve representing the deaths after chlorine and phosgene poisoning is based on 424 fatal cases resulting from three cloud gas attacks, whilst that indicating the deaths from mustard gas is based on fifty-nine fatal cases which occurred amongst a group of particularly severe casualties resulting from a single heavy bombardment with yellow cross shell.

During the mustard gas period less than ten per cent of the gas casualties could be attributed to the action of green cross shell, and there is no reason to

believe that the mortality amongst these casualties was any higher than in the period July, 1916, to July, 1917.

Blue cross shell were almost as ineffective as casualty producers, and the chlorarsines contained in them were not responsible for any deaths. These shell were introduced by the Germans with the idea that the distressing irritant symptoms which make their appearance very rapidly on exposure to air in which these chlorarsines have been disseminated would be sufficient to put men temporarily out of action, and so render them an easy prey to some other more lethal gas as well as less capable of withstanding an attack. In addition the Germans hoped that these toxic substances would penetrate our respirator, a hope that was not realized. As harassing agents blue cross shell undoubtedly had some value, and hampered troops by causing them to wear their respirators, but even if a man was put out of action for the moment by the irritant effects, these had in most cases almost entirely vanished by the time he reached a medical unit. Many of such cases, though no doubt severely affected at the time, could be returned to their units fit for duty within a day or two after admission to a medical unit in an army area. So transitory were the symptoms that many men never left their units at all. Nothing really definite in the way of after effects could be made out with certainty in the cases of blue cross poisoning that reached the base.

The mild character of the blue cross casualties prompts me to speak of a difficulty that medical officers in army areas were continually being called upon to face. The gravity of a severe case of phosgene poisoning, in whom pulmonary œdema has already developed, is immediately apparent, and any case of mustard gas poisoning affords objective evidence which permits of a correct diagnosis. Many cases of alleged gas poisoning, however, reach medical units with little or nothing to show in the way of symptoms of gassing; and there is always the possibility that some of these men have never been exposed to gas at all. How are you to deal with these cases? Careful examination, in the hopes of eliciting some evidence of gassing, and the patient's story as to what happened, may throw light on the case provided that you are thoroughly acquainted with the effects produced by the different warfare gases. A rule that could be safely applied in France was to detain any case that appeared in the least doubtful for forty-eight hours; if no definite objective symptoms had developed at the end of that time, one could be confident that not more than an insignificant dose of gas had been absorbed by the case, and the man could speedily be returned to duty. One must necessarily err on the side of caution in these cases, even at the risk of countenancing a few malingerers, for there is always the possibility that the case one is dealing with may prove to be a delayed case of poisoning with an acute lung irritant gas. A note by the regimental medical officer as to the nature of the shelling may be invaluable in these cases. It is most desirable that trivial cases of gas poisoning should not be evacuated from army areas, if the military situation permits their retention, so as to avoid the inevitable delay that must otherwise occur before the man can be returned to duty. The "N.Y.D. Gas Centres," which were established in France in army areas, proved themselves extremely valuable in this connexion.

Up to this point I have been dealing with the problem of gas poisoning as it is presented to the medical services in army areas in the vicinity of the battle

zone. There is, however, another and most important aspect of the question which arises, in the main, in hospitals on the lines of communication remote from the battle front, and in permanent hospitals and convalescent depots where cases are retained until their treatment is completed; and I want to put before you some general features in the after-history of the gas casualties evacuated from army areas, and call your attention to the question of invalidism from gas poisoning.

Since neither the simple lachrymators nor the chlorarsines, as we experienced them in France, gave rise to material disability, we may confine ourselves to the question of poisoning with the acute lung irritants and with mustard gas.

Those who survive the initial critical stage of pulmonary œdema caused by chlorine or phosgene have a very good prospect of ultimate recovery. Secondary bronchopneumonia is quite uncommon in these cases. One might expect that so severe an inflammatory condition in the lungs would be followed by some lasting pulmonary disability such as chronic bronchitis. While this is true of a certain number of the casualties, it does not constitute a serious cause of disability. By far the most common after-effect is the "irritable heart syndrome," associated with undue breathlessness on exertion and a liability to abnormal frequency and shallowness of the breathing—though physical examination of the chest reveals no definite abnormalities in heart or lungs. These symptoms have been recently discussed in detail by Haldane,[1] who has pointed out how large a part is played by neurasthenia in these cases. The length of the disability caused by the symptoms of "irritable heart" varies a good deal, and much depends on the skill with which these cases are handled when once the condition has developed. Experience in France led us to believe that the mildest cases of chlorine or phosgene poisoning could be returned to duty within one to two weeks, whilst there was a reasonable probability that two-thirds of the remainder would recover completely within two months. It does not follow by any means that those who have been most severely affected in the acute stage are necessarily the ones to be incapacitated for the longest time, for a number of cases are known in which men were on the border line of death in the acute stage of poisoning, and yet became fit for duty again in four or five months, and rejoined combatant units in the various theatres of war.

When mustard gas was first introduced, we undoubtedly exaggerated its invaliding power, for the multiplicity of the symptoms and the entire absence of knowledge as to possible after-effects naturally led to the gravity of the condition being over-estimated. In the first few months of the mustard gas period almost sixty per cent of the gas casualties were evacuated to England, and the majority of the cases retained in France for treatment were absent from duty for from six weeks to three months, but as the novelty of the situation wore off much better results were obtained.

From the spring of 1918 onwards a very careful investigation of the question was made in the Boulogne area under the influence of Colonel T. R. Elliott, C.B.E., D.S.O., F.R.S., the consulting physician to that base, with the co-operation of many medical officers at the different hospitals and convalescent depots. They set out to ascertain whether the period of invalidism could be materially curtailed

[1] Haldane, loc. cit.

without detriment to the cases, and modifying and improving treatment in the light of their experience of the previous months, they obtained the most gratifying results. In mustard gas cases the neurasthenic element enters extensively into the picture, and it was the recognition of the true part played by this that contributed largely to the improvement in the results. Firm control of the patients from the start, and the restriction of the period of detention in hospital to a minimum, prevented the cases from falling into a morbid condition and developing those functional symptoms which so often delay convalescence, effects which tend to be exaggerated by prolonged treatment in hospital.[1] From May, 1918, onwards, the evacuation to England of cases from the Boulogne area never exceeded twenty-five per cent of the admissions, the remainder being retained in France till fit for duty. Of those retained many were cured within four weeks, and practically all within eight weeks, and better and better results were obtained as the year went on. Severe chest trouble and extensive burns were the most serious factors leading to prolonged disability; not more than ten per cent of the cases whose eyes were affected sustained a degree of corneal injury which was sufficient in itself to require invalidism for more than six weeks. That the restriction of hospital treatment was justifiable was shown by examining the records of the convalescent depots to which the cases were transferred from the hospitals, for the number of cases who had to be readmitted to hospital was extremely small (see the table below); in the case of one such convalescent depot the average time intervening between exposure to gas and transference to base details as fit was 40·3 days in the case of men who had suffered from material skin burns, and 33·2 days in the case of those who had not.

Though the question of invalidism was particularly investigated in the Boulogne area, and the best results obtained there, the disposal returns for all hospitals on the lines of communication showed a general improvement in the results obtained in the last few months of the war over those obtained in 1917, in spite of the fact that there was no indication of lessening in the general severity of the cases. This is shown by the following figures:—

Disposal of Gas Casualties from Hospitals and Convalescent Depots on Lines of Communication in France.

Hospitals	Sept. and Oct., 1917	Sept. 9—Oct. 26, 1918
Total number of cases dealt with	16,839	24,642
Died	0·9 per cent	1·1 per cent
Evacuated to England	53·5 ,,	28·1 ,,
Returned to duty	2·3 ,,	2·6 ,,
Transferred to convalescent depot	24·4 ,,	50·4 ,,
Remaining at end of period	18·9 ,,	17·8 ,,
Number evacuated to England as percentage of cases actually disposed of	66·0 ,,	34·1 ,,
Convalescent Depots		
Total number of cases dealt with	7,409	17,529
Returned to duty	56·1 per cent	65·9 per cent
Readmitted to hospital	2·1 ,,	3·4 ,,
Remaining at end of period	41·8 ,,	30·7 ,,

[1] Wilson and Mackintosh (*Quart. Journ. Med.*, xiii, p. 201, 1920) have given a very complete account of their experience with mustard gas cases at No. 7 Stationary Hospital, and this affords an admirable instance of the way in which appropriate treatment based on a recognition of the true significance of the different symptoms may accelerate recovery.

Naturally there was a good deal of variation in the results obtained at the different bases. Thus in September and October, 1918, when the cases evacuated to England formed 34·1 per cent of the cases disposed of from all hospitals on the lines of communication, Boulogne showed a figure for this ratio of 19·4 per cent, Rouen of 40·5 per cent, and Etaples of 62·1 per cent; but even if we subtract the Boulogne figures the ratio for all other bases is 42 per cent, i.e., a great diminution below what took place in 1917. You must, however, bear one fact in mind in considering these figures. The ease with which casualties can be retained in medical units on the lines of communication must depend largely on the military situation at the time, and a heavy influx of battle casualties may compel the transference of even comparatively mild cases to more distant hospitals so as to avoid undue congestion, though under quieter conditions such cases might without difficulty be retained till completely cured.

While results in France were showing this steady improvement, there is reason to think that the results in England were not nearly so good. From such statistical evidence as I have seen the period during which gas casualties evacuated to England were classed as unfit for duty might be reckoned in months rather in weeks, and even if we assume that these casualties were on the whole of a more severe character than those retained for treatment in France, the experience at Boulogne would seem to indicate that this period of invalidism was excessive. I feel sure that far better results would have been obtained when the careful investigations made in the later months of the war had been fully appreciated. The pamphlets on the diagnosis and treatment of gas poisoning issued by the Director-General of Medical Services in France mainly treated of conditions in the early or acute stage, for that after all was the immediate problem that faced us in France, and it required months of patient investigation to reveal the after-effects of acute lung irritant or mustard gas poisoning in their true proportions. The pamphlets in themselves would, I think, tend to give an exaggerated idea of the severity of gas cases as a whole to medical officers who had not had the opportunity of seeing personally cases of all degrees of severity in the earlier stages after gassing, and this serves to show how important it is to obtain and to circulate all the information possible if you are to obtain the best results.

Finally may I ask you to consider for a moment or two the general significance of the facts I have laid before you. Poisonous gas as an offensive weapon was not introduced by the Germans until the ninth month of the war, and the new weapon was subsequently developed slowly in a series of progressive stages. We must, I suppose, still regard gas warfare as in its infancy, for we have touched only the fringe of the resources of the chemist, and as research increases our knowledge of toxic substances and new methods are devised for the liberation of these poisons the effectiveness of gas warfare may easily be increased far beyond what we experienced during the war. We have at least gained an insight into the possibilities of this new development in warfare. It would clearly be wrong for us to regard the poisonous substances used in warfare merely as killing agents, for temporary disability, be it for a brief period as was the case with the lachrymators or chlorarsines or for a longer period as was the case with mustard gas, may be quite sufficient to allow some military object to be gained. The medical services must be prepared to meet any of these conditions.

We started the war with hardly any knowledge of the effects of the poisonous gases that we were called upon to face in the field; such information as there was had been derived from cases of accidental poisoning in mines, sewers, chemical works and the like, and the scanty data were unknown to the great majority of medical men. Knowledge regarding some types of gas poisoning has now been gained by bitter experience, and the lesson that we have learned ought never to be forgotten. An entirely new type of battle casualty has now to be reckoned with in modern warfare, one whose treatment falls within the province of the physician rather than the surgeon. I cannot forecast the lines along which gas warfare may develop in the future, but of this I am convinced—unless the medical services keep abreast of the development of modern science they will run the gravest risk of being found wanting in a future war, and I should like to plead here for the closest liaison between the medical and gas services.

Under the present arrangements the responsibility for general defensive organization against gas or other poisons used for offensive purposes does not rest with the medical services, and they are therefore free to centre their attention on the clinical and therapeutic aspects of the question. As the progress of chemistry suggests new modes of offensive warfare, physiology and pathology must form the basis for rational treatment of the casualties that may result. The saving of life and the relief of suffering are the immediate objects of the medical services in time of war, but you cannot hope to attain success in this unless you are completely conversant with the nature of the pathological changes and with the significance of these changes to the organism. Remember that it is by no means easy to deduce from experiments in the laboratory the precise effects that may be caused by gases in the field under war conditions; you must try and weigh experimental evidence in the light of the experience we have gained during the war. You must not limit yourself to the treatment of the individual case; you must take a broader view than this, and review carefully the significance of gas warfare to the forces in the field as a whole, and consider how the Medical Services can best fulfil their function. That is why I have put before you numerical data regarding the casualties, deaths and disability caused by gas poisoning during the war. The figures in themselves are quite enough to show you the magnitude of the problem. You can judge from these how great are the demands made on medical organization, what provision is necessary for adequate accommodation and suitable equipment in medical units, and how carefully effective methods of handling and transporting the casualties must be thought out.

I have deliberately laid some emphasis on the duration of invalidism, for this is, I think, a side of the question to which too little attention is apt to be paid. Excessive length of hospital treatment is undoubtedly bad for the cases, and implies an undue burden on hospital accommodation and on the medical and nursing staff. The strain involved in modern warfare affects not only the troops at the seat of war but the whole nation as well, and the ability to maintain the numbers and quality of the fighting troops without prejudicing the other necessary activities of the nation may become the crucial factor. Wastage due to casualties is bound to be great, and reduction to a minimum of this wastage may well prove decisive. I have tried to give you some idea of the extent to which careful investigation showed that wastage due to gas poisoning could be cut

down by reduction of the period of invalidism. Investigations of this character are of the utmost importance and should receive every encouragement, but if full value is to be obtained from the results it is essential that the information should be disseminated widely and without delay to all medical officers likely to be concerned with the casualties.

Report.

NATIONAL HEALTH SERVICES.[1]

Novel Scheme of Re-organization.

The Consultative Council on Medical and Allied Services which is associated with the Ministry of Health and was appointed in October last, was invited by Dr. Addison on its formation to consider the problem of forming a systematized medical service established on a local basis but applicable area for area to the whole country. The Council, of which Lord Dawson of Penn is the Chairman, has now issued an Interim Report, not indeed as a final exploration of so large and complicated a subject but rather as an indication of the trend of its deliberations and conclusions up to date. The Report is issued now "in view of the urgency which attaches to the orderly building of a constructive health policy and the close relationship which exists between medical services and problems connected with the Poor Law and Local Government."

The Council begins its Report with a brief description of the failure of the present organization of medicine to bring the advantages of medical science within reach of the people. Medical treatment while becoming more effective tends at the same time to become more complex. This tendency is exemplified in the modern handling of such complaints as appendicitis and tuberculosis. As the complexity of treatment becomes greater, it grows increasingly difficult for the individual practitioner to administer the full range of treatment, requiring, as it does, access to such resources as those of bacteriology, biochemistry, radiology and electrotherapeutics, while the number of patients who can afford to pay for it diminishes. Public opinion again appreciates more and more that the home does not always afford the best hygienic conditions for recovery from serious illness. The Council lays it down that any scheme of medical service must be open though not necessarily free to all classes of the community; that it must be such as can grow and expand and adapt itself to varying local conditions, and that in each locality it must comprise and provide for all the medical services, preventive and curative, necessary to the health of the people, all these agencies being brought together in close co-ordination under a single health authority for each area.

At the centre of the medical service of the country lies the treatment which

[1] Interim Report by the Consultative Council on Medical and Allied Services associated with the Ministry of Health.

the medical practitioner gives to his patient, either at his own surgery or at the patient's private house. The report of the Consultative Council contemplates that this domiciliary medical service should continue, the doctor attending his patients as heretofore, either at their own homes or at his surgery, and carrying out there such treatment as falls within his competence. All domiciliary service would, however, be brought into relationship with a primary health centre which would serve as the rallying point of all the medical services, preventive and curative, of the district for which it was established. Primary health centres would vary in size and complexity according to local needs and with their situation in town or country, but the purposes which such a centre would serve are indicated by the outline which the Council gives of the equipment which should be aimed at, as the scheme becomes more thoroughly established and eventually obtained.

There would be at the primary health centre, according to this outline, wards of varying sizes and for varying purposes including provision for midwifery, an operating room, a radiography room, a laboratory for simple investigations, a dispensary, medical baths, and a common room which would serve as a meeting place for the general practitioners of the district and for the storage of clinical records on an agreed and standardized basis. A primary health centre would also contain accommodation for communal and preventive services such as those for pre-natal care, child welfare, medical inspection and treatment of school children, physical culture, and the examination of suspected cases of tuberculosis. So far as midwives and nurses are not available in particular districts under other arrangements their services could be provided from a centre. A dental clinic with a staff of visiting dental surgeons would be another important branch of the equipment. It is suggested that in many instances existing buildings such as cottage hospitals could be adopted as primary health centres, at any rate as a beginning.

It would be the distinguishing feature of these primary health centres, one of which should ultimately be found in every convenient centre of population, that they should be staffed by the general practitioners of the district which they served, patients who visited them or were accommodated in them retaining the services of their own doctors. The general practitioner would be able in a proper case to arrange for the transference of a patient to the primary health centre where, retaining the patient still under his own care and control, he would be able to continue the treatment under more favourable circumstances and with a readier access to the resources of modern medical science than are afforded in the surgery or are possible within the patient's own home. The primary health centre would provide the patient (on the terms described below) with food, nursing and all equipment for efficient treatment, but not with medical attendance, which would be paid for either by the patient himself (if a private patient), or through some method of insurance or by the local health authority. While the primary health centre thus provided the general practitioner with means not now generally available of offering his patient in a proper case what may be described as "hospital treatment," whilst still keeping him under his own control, it would also serve the general practitioner as a centre of professional life, bringing him into daily contact with the other practitioners of his district and occasional contact with the consultants and specialists who would attend at

fixed intervals from the secondary health centres with which each group of primary centres would be brought into relationship.

The secondary health centre of each district would be situated in a town where an adequate equipment would be possible and an efficient staff of consultants and specialists could be assembled. Each secondary health centre would be within access of all the primary health centres in the area. The Consultative Council contemplates that for many secondary centres the nucleus of organization would be found in existing hospitals. In other districts, however, it would be necessary to establish a complete and model secondary health centre. In this connexion they point out the importance of a hospital survey at some early date. The results of this survey would afford statistical data for recognizing the areas in which the existing provision is inadequate and the degree of the inadequacy. Like the primary health centres, the secondary centres would bring together into one organization agencies both of preventive and curative medicine, though in the secondary centre each agency would, as will now be seen, be of a more specialized character. On the curative side, for example, the services of the secondary health centres would be mainly of a consultative type. They would receive cases referred to them by the primary centres either on account of difficulties in diagnosis, or because in the diagnosis or treatment of such cases a highly specialized equipment was necessary. Secondary health centres would in fact need a complete hospital equipment.

Cases referred for consultation or treatment from the primary health centres would attend at the out-patient clinics of the secondary centre or would occupy in-patient beds. The medical staff of the secondary centre would be responsible for the treatment of these cases but general practitioners would have every opportunity to keep in touch with their patients while attending the centre and to resume supervision over them on discharge. The duties of consultants attached to secondary centres would consist of regular attendance at fixed times in their out-patient clinics where they would see cases referred to them; periodical visits to primary health centres in the district allotted to them and special visits of emergency to primary health centres and in certain circumstances to the homes within their areas, always in consultation with the general practitioner. The consultants would be part-time officers and would be paid on a time basis with extra fees for special visits. This would leave them time for their private consulting practice. The Report discusses at length the qualifications necessary for entrance into this consultant service and the methods of election to it by committees of selection on which medical men will have the larger representation. In those parts of the country where it is geographically possible it would be desirable that every secondary health centre should be brought into relationship with the teaching hospital. The teaching hospital of the district would be found in some large city and to it would go cases of unusual difficulty from secondary and primary health centres which would in turn be permeated by the academic influence and the spirit of inquiry and progress associated with a teaching hospital.

It has already been pointed out that the primary centre would, according to the views of the Council, provide the patient with food, nursing and all equipment for efficient treatment but not with medical attendance. At the secondary centres the contribution of cost made by the patient would include in addition the services of the consultant, though it would be open for the patient to request the additional

service of a selected consultant or specialist, being in this case responsible for the fee. On the subject of finance generally, the Consultative Council recognize that while preventive services must of necessity be publicly provided, the provision of curative services free of charge at the health centres would impose a heavy burden on public funds. While, therefore, certain members feel that these services should be provided at the cost of the community, the majority recommend that in the public wards of the primary and secondary health centres, standard charges should be made for treatment, though it is contemplated that these charges might vary in different parts of the country, and that they could only as a rule be a contribution to the cost of treatment, which is often in its entirety beyond the means of many citizens. The Council further recommends that private and self-supporting wards should be a part of the provision at the health centres though the essential services in the public and private wards would be identical.

In order to administer the scheme in each district the Council glances at the need for a new type of local health authority to bring about unity of local control of all health services, curative and preventive. On this body the Council asks for due representation of the medical profession and is of opinion that the authority should in each case be assisted by a local medical advisory council.

On the subject of a State medical service the Report says "the alternative of a whole-time salaried service for all doctors has received our careful consideration, and we are of opinion that by its adoption the public would be serious losers. No doubt laboratory workers and medical administrators who do not come in personal contact with the sick can with advantage be paid entirely by salary. The clinical worker, however, requires knowledge not only of the disease but of the patient: his work is more individual, and if he is to win the confidence so vital to the treatment of illness, there must be a basis not only of sound knowledge but of personal harmony. The voluntary character of the association between doctor and patient stimulates in the former the desire to excel both in skill and helpfulness. It is a true instinct which demands 'free choice of doctor'; and there should be every effort, wherever possible, to make this choice a reality. In no calling is there such a gap between perfunctory routine and the best endeavour, and the latter, in our opinion, would not be obtained under a whole-time State salaried service, which would tend, by its machinery, to discourage initiative, to diminish the sense of responsibility, and to encourage mediocrity."

Ministry of Health,
Whitehall, S.W.1,
May 21, 1920.

Reviews.

REVIEW OF NERVE INJURIES AND THEIR TREATMENT. By Sir James Purves Stewart, K.C.M.G., C.B., F.R.C.P., and Arthur Evans, M.S., M.D.Lond., F.R.C.S. Second Edition. Published by Henry Frowde, Hodder and Stoughton. 1919. Pp. xii and 249. Price 12s. 6d. net.

This is quite the best short manual on nerve injuries and their treatment that we have seen, and the publication of this revised and enlarged second edition shows that it has been appreciated.

The conditions with which it deals have assumed great importance since the war, and now that officers and men suffering from the effects of nerve lesions are scattered all over the country in their homes instead of being segregated in special hospitals under neurologists, the general practitioner who comes in contact with the cases will find this little book most helpful both as regards prognosis and treatment.

The treatment to be adopted in the waiting period before operation, and the continued treatment after operation, are rightly emphasized.

The book is well produced and clearly and profusely illustrated. It is remarkably free from errors in printing.

As pointed out in the preface, it is the combined work of two authors, yet there is no overlapping noticeable in the different sections of the work.

On p. 24, line 5, instead of ACC $<$ KCC it should be ACC $>$ KCC.

The book can be very strongly recommended to students and practitioners as a simple and clear account of the present knowledge of nerve injuries and their treatment.

A MANUAL OF WAR SURGERY. By Colonel Seymour Barling and Major J. T. Morrison. London: Henry Frowde, Hodder and Stoughton. 1919. Pp. xvi and 479. Price 21s. net.

This book records the surgical experiences of what may be called the advanced base. As Sir George Makins says in his preface: "Few men are in a position to write with confidence and authority on the progress and treatment of gunshot injuries from the time of reception of the wound to the period of actual recovery and cure." In the early years of the war the interest naturally lay in the front areas, and the casualty clearing station work has had many exponents. The advanced base in France has, so far, been almost inarticulate, but in the present volume full justice is done to the admirable work which was undertaken. It must be remembered that this was the period of a patient's case in which sepsis had to be overcome; fractures, almost invariably complicated by sepsis, had to be put on the high road to consolidation with correct alignment, and with reverence, be it spoken, the failures and misjudgments of the casualty clearing station to be corrected. There was a natural tedium in work of this kind which was absent from the more lively experience of the casualty clearing station surgeon. The salutary interchange of surgeons between front and base, which was happily arranged in the later months of the war, was needed no less for increased surgical experience than for mutual understanding.

Surgical opinion has always consolidated itself on a foundation of healthy differences of opinion. And this book might consequently have been less valuable if it had appeared earlier. The ebb and flow of opinion may be profitably, and even amusingly, studied in the current medical journals during the war. But

among the various articles there will always be found some which obviously fix a landmark, and become, as it were, a focus of crystallization for a particular branch of war surgery. Cushing's article on head wounds may be taken as an instance. It is on the sure foundation of work of this kind that the authors of the articles in Colonel Barling's and Major Morrison's work have based themselves. There is no suppression of individuality, indeed, but to any one who has had an opportunity of seeing the work of a large number of advanced base hospitals, it is evident that there were at the end of the war no real differences of principle in the treatment of wounds.

It must be conceded that this work does not tell the whole story. More remains to be said by the Home bases. Final results are even now undergoing their appreciation and summing up, and until they are before us we cannot see the picture whole. But, as a valuable contribution to one stage of war wounds, we welome the present volume. E. M. P.

ELECTRICAL TREATMENT. By Wilfred Harris, M.D., F.R.C.P. Third edition. Cassell and Co., Ltd. Pp. 354.

As stated in the preface to this third edition, electrical treatment has been brought into greater prominence owing to the numerous war wounds which have required treatment by these methods, and this manual should be of great service to those who have to deal with the after-results of gunshot injuries, especially wounds of nerves.

Although the book is mainly directed to the application of the faradic and galvanic currents, yet a full and clear account is given of all the methods of applying electricity to the treatment of disease and injury.

A future edition would be improved by the inclusion of the method of testing by means of condenser discharges which has been found so useful in determining the extent and recording the progress of a nerve injury.

The description of the various types of electricity and the means of their production is clearly and fully given. The descriptions of the sinusoidal and high-frequency currents are particularly good. From reading the book the number of diseases amenable to electrical treatment would appear to be very large, and the author gives a very fair account and makes no extravagant claims, but states clearly the conditions in which some good results may be expected.

It is to be regretted that the author deals so shortly with war neuroses, a subject which is still largely occupying the attention of the profession.

Treatment by X-rays is only mentioned and radium treatment is excluded from the scope of the book.

The whole subject is dealt with in a most interesting way and the illustrations, which are confined to electrical apparatus, are good. The book is remarkably free from typographical errors, and is supplied with a good index.

We can strongly recommend this book to those taking up the subject of electrical treatment, and as a guide to practitioners as to the type of case suitable for this form of treatment.

A HANDBOOK OF BRITISH MOSQUITOES. By William Dickson Lang, M.A., Sc.D., Assistant attached to the Department of Entomology, London. Printed by Order of the Trustees of the British Museum, 1920.

This is a useful publication. Its intention is to "make it possible for the student to identify all the British species without much difficulty." That is well done by Dr. Lang. In language terse and unambiguous, description is made of the points of generic and specific affinity and distinction. The text-figures drawn

by Mr. E. Terzi are clear and copiously illustrative of the text. The few plates, reprinted from another British Museum publication, do not "faithfully depict the natural colours," as is there claimed for them by Austen.

Information of the principles of classification is avoided, perhaps being considered too elementary and to be obtained elsewhere. The student and dilettante, however, find difficulty in understanding the finesse of classification—the essential nature, for instance, of the generic distinction of *Ochlerotatus* and *Finlaya*, of *Theobaldia* and *Culicella*—especially where conventional nomenclature is departed from. In a footnote on p. 78 is found: "See also under *Ochlerotatus geniculatus*," whereas in the text the genus *Finlaya geniculata* is described. It would help the student to be told in the handbook why certain characters determine Genus and others Species.

In the Systematic Account some description is given of the bionomics of the mosquitoes, humanly a most important study. Notwithstanding that a vast amount of scattered observation must be on unofficial record, our knowledge of the bionomics of the British mosquitoes is admittedly imperfect. This reproach should be removed by the authorities making liberal provision for the official prosecution of field work. Then we may expect an authoritative monograph of the British Culicidæ, for which this work of Dr. Lang is a valuable preparation.

A. M.

PRACTICAL TROPICAL SANITATION: A POCKET-BOOK FOR SANITARY INSPECTORS IN THE TROPICS. By E. P. Minett, M.D., D.P.H., D.T.M. and H., Major, R.A.M.C. (T.F.), Government Medical Officer of Health, British Guiana.

The author of this publication says, "This small book is written with the idea of providing a pocket reference book for sanitary inspectors in Tropical Countries." The idea is good, but it is questionable if the practical effort will have utility beyond the administrative domain of the writer. Sanitation in the Tropics is a very individual matter. Administration and executive are intimately linked. Conditions, matériel, and personnel are so diverse, that health officers have to work out their own local salvation, making the best of the staff and means provided. There are many interesting sketches and diagrams relating to conservancy, water-supplies, markets, disinfection, and other matters of sanitary importance. Certain by-laws, somewhat meticulously reproduced, should afford hints to pioneer officers in hygienically virgin soil. The style of the writer is conversational and strictly unconventional,perhaps designedly so and locally serviceable.

In a tropical situation where the forces of opposition are many and the temptation to slack down is strong, Dr. Minett is worthy of sympathy and encouragement, for the energy and enthusiasm evidenced in the publication of this little book. A. M.

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Original Communications.

ON THE RELATION OF TEMPERATURE TO MALARIA IN ENGLAND.

By MAJOR ANGUS MACDONALD, O.B.E.
Royal Army Medical Corps.

(*From a Report to the War Office, dated December* 12, 1919.)

PHYSICIANS and the people from all time have undoubtedly recognized the direct association between malaria and warm weather, normal in its occurrence in malaria-endemic countries, or abnormal in countries where malaria occurred occasionally. While in recent years before the war, cases of malaria of indigenous origin have no doubt been occurring sporadically in parts of the world outside endemic bounds, there lacked the importation of infection in bulk to draw attention to these occurrences which would naturally be mild, and unless seen by one experienced in malaria might escape diagnosis or be passed over with a suspicion.

Importation of malaria carriers as an aftermath of war has, however, focused attention on the occurrence of malaria in countries where, in spite of the presence of anopheline mosquitoes, malaria has been practically absent during about a couple of generations.

Some consideration is here given to the problem of the relation of temperature to malaria, as exemplified by infection arising in England, and the conclusions arrived at justify the precautionary measures adopted in the years of war. It was believed that malaria had previously existed in England. It was known that anopheline mosquitoes are widely distributed, and large numbers of infected men were inevitably being returned from malarial countries. The conclusions, however, further establish the remaining factor concerned in malaria infection, showing that many carriers and many mosquitoes may produce little or no

indigenous infection unless a suitable temperature coincides with carrier importation.

But first, a few words on certain terms here employed. Discussion and argument frequently are carried on without an understanding between the interested parties as to definition. A mutual agreement as to premises may not necessarily lead to avoidance of discussion, but certainly will limit discursive recrimination. Recent consideration of the occurrence or recurrence of malaria in parts of the world, whence it seemed to have been banished, has demanded the frequent use of terms which have manifestly borne different signification to different writers. A few of these terms, which may commonly appear, are here considered, and a definition given to them which, accepted or not by others, at any rate affirms the significance of their connotation to the writer of these pages.

Indigenous means simply "born in," and implies origin in the country. Its modern strict application signifies the country of origin, without any implication beyond the fact of origin. Applied to malaria, it states the fact that the infection of malaria has been (naturally) acquired in a certain country—England, Greece, East Africa—without any affirmation regarding the conditions which determine its occasional or inevitable occurrence there. Cases of malaria of indigenous origin have occurred in England in recent years. The infected carrier, the source of the parasite carried by mosquitoes naturally present in England, may have brought that parasite from some other part of the earth; but with carrier, mosquito, victim, and the necessary temperature to foster the virus all present in England, infection occurred in England which was indigenous there.

Endemic means literally "in or among the people" and is limited in its application to an occurrence which constantly or regularly is observed amongst a certain people, or in a certain region. In tropical and subtropical countries malaria is found all the year round. There may be seasonal remission of infection, absolute or relative, but the factors of infectivity are always present; the infection of malaria is maintained from within, no dying out of the disease naturally occurs, and importation of infection is not needed to maintain indigenous occurrence.

Contrariwise, there are temperate countries where all the factors necessary for malaria propagation are not always present; the infection of malaria is not naturally maintained among the people; re-importation of infection is required to cause indigenous occurrence; and a coincidence of factors is necessary to maintain infection over years and to enlarge the incidence. Such countries are not looked on as the home of malaria; malaria cannot strictly be said to be endemic there; the most that can be allowed is the studied use of the modification—"*limited*" *or* "*discontinuous*" *endemicity*—in any reference to the continuity of indigenous occurrence over periods of years resulting from intermittent importation of carriers. Evidence in England points to the dying out and reintroduction of malaria

throughout historic time, the factors of infection not being valid to maintain the disease on the people continuously.

Epidemic, literally "upon the people," is merely a wide incidence, in point of time, of (infectious) disease; the extension of the disease being due to the accession of some hitherto non-operating factor or to the modification of an essential factor. The most noteworthy instances of epidemical malaria have resulted from volume migration of carriers coinciding with abnormal elevation and continuity of elevated temperature. Epidemic may occur in countries where malaria is endemic and also where malaria is not endemic. The cases are indigenous in reference to the country of occurrence, whether or not that country is an endemic home of malaria.

Autochthonous, "sprung from the soil," has a limited application to inhabitants so intimately related to the land of their habitation that more remote origin cannot be assigned them. It is a mere bandying of terms to use the word as synonymous with indigenous. "Autochthonous" has no signification when applied to malaria. It might be employed in pedantic reference to *anopheles* in any country where malaria occurs, for history does not reveal the date of importation of *anopheles* to any part of the earth—excepting perhaps the possible implantation of new species in Mauritius or Chili.

The factors of infection in respect of malaria are:—

(1) The necessary vehicle of transmission, the *anopheline* mosquito;

(2) The carrier of the virus or *plasmodium*—the infected human;

(3) The temperature suitable for the sexual development of the *plasmodium* within the mosquito; and

(4) The victim for infection—man.

These are the essential factors, anywhere, needful for the production of indigenous malaria. To ensure endemicity the temperature factor requires an elevation and continuity not attained normally in all temperate latitudes. Epidemic may occur in tropical, subtropical and in a limited zone of temperate countries, owing to modification of any one or more than one of these factors, chiefly from large movements of carriers with coincidence of abnormal heat.

The limitation to England of a consideration of the relation of temperature to malaria is made because the writer has had specially to study indigenous malaria in England during the years from 1916 to 1919. Inference can be drawn in application to other temperate countries, in which malaria may or may not be endemic; while in regard to tropical and subtropical countries, factors, though not essentially different, are modified and require distinct consideration. That temperature directly influences the distribution and incidence of malaria has always been accepted by physicians. They have recognized a line of latitude in the northern hemisphere, the hemisphere of ancient civilization, south of which malaria was to be met with in an intensity generally increasing towards the equator. Beyond this line, which is represented zigzagging across the continents of

Asia, Europe and America, according to the local causes, topographical configuration mainly, which determine a mean temperature of 59° F. to 60° F. for some period of the year, malaria was not recognized endemic, although under certain conditions of rare occurrence indigenous cases were known to arise.

On the previously fairly generally accepted explanation of the origin of malaria in miasm, in the vapours arising from the decomposition of alternately submerged and exposed vegetation, it was naturally assumed that the virulence of the miasm depended on the nature and rate of decomposition, which developed most intensity in tropical regions, and was limited by the reduction of temperature experienced in proceeding to northern latitudes. The assumption was fortified by the known distribution of the disease, and by its occasional epidemic occurrence in times of protracted abnormal high temperature, even sometimes in regions where its appearance was rare or original. Seasonal variations in incidence of malaria were most obvious; and the outstanding feature in seasonal fluctuation lay in the spring and autumn rises. Secular fluctuations due to abnormal meteorological conditions have been also historically recorded; and widespread increase and regional extension of malaria have been most remarked where there has been coincidence of wholesale movements of populations with these abnormal meteorological conditions.

The history of the existence of malaria in England in past time is one which deserves much more serious study than it has yet received. The common outlook of the medical profession and of authority in England is that at one time the condition of the country, the manner of living of the people, and the absence of medical control over the disease brought about a state of affairs enabling the existence of malaria and its maintenance in endemic form throughout centuries. The records of hospitals and departments of State, the writings of physicians who by some chance have attained modern repute, the references in general literature, and popular tradition are taken as evidence in support of this general belief. Critical study of these different sources of information, however, puts difficulty in the way of making this facile acceptation of the continuous endemicity of malaria over any period of time in England. The last recorded and accepted visitation of malaria in England was in the years from 1857 to 1860. The present generation of physicians has been brought up in total ignorance of malaria as a practical disease entity in England. When called on to consider the matter of its presence in this country, they have only to look back over the period of time represented by their own and the previous generation, and find conclusively in record and tradition that malaria was present in many parts of England in the late fifties of the nineteenth century, and was so common as to be recognized as epidemic in certain districts. They stop here in their retrospect, and without further investigation take it for granted that that period represented part of a continuous whole which stretched back without breach into the

past of history and tradition. The further outlook on malaria in England has been that since that time of undoubted recognition in the fifties, malaria rapidly subsided and soon disappeared throughout the country. When special investigation has been undertaken on specific suggestion, such as the recurrence of malaria in these recent years of war, modification of outlook has been made to the extent of admitting that undoubtedly stray sporadic cases have been occurring in different parts of the country during the past sixty years of apparent disappearance. Instead, however, of there having been continuity of endemicity of malaria in England, up to and more or less ceasing with the year 1860, the records of history give definite indication that malaria occurred in England with intermittency, that probably the periods between occurrence of epidemic have been more prolonged in recent centuries, and that in some past time there may have been continued endemicity, or at least in parts of the country an occurrence of malaria of sufficiently frequent repetition to ensure its general recognition by the people and so to justify the assumption of its endemic persistence then.

Going back beyond 1860, the next date at which any recognized exacerbation or recurrence of malaria in England took place is in the years 1823 to 1826. At the date 1827 a writer on malaria called clamantly for recognition of the disease in England, and railed against the stupidity and lack of perspicacity in the medical profession of the time, which failed to see malaria and its protean results broadcast on the land. Similarly going back through the years there is record of malaria to be found and a recognition of its excessive incidence at intervals of years; although amongst the older writers there is more suggestion of a recognition of its continuity. But in their time, it must be admitted without shame, that the discrimination between different diseases was not clear; and there was, besides, in descriptions of malaria, a slavish reiteration of the writers of medicine of Rome and Greece.

Coming directly to consider the relation of temperature to malaria in England, the records of temperature from 1763 to date afford material on which to estimate the probabilities of continuous endemicity of the disease in past time, and of its occurrence or recurrence in the present.

Within this selected period, over the whole of which tolerably accurate thermometric records are available, there has occurred no definite change in the temperature conditions in England. Extremes both of maxima and minima have been recorded with no regular periodicity; but the mean of the whole period differs little from means taken for casual decennia throughout.

Evidence from epidemiological observation, as already stated, justifies the assumption that a mean temperature of about 59° F. to 60° F. is necessary over at least sixteen days for the consummation of the plasmodial cycle within the mosquito—that is, for the development of malaria infection in anopheline-occupied country. The mean temperatures by months for

Greenwich, which may be taken to represent the temperature generally of the Thames valley, and practically the maximum mean for the British Isles, are here given for the period from 1841 to 1890.

TABLE I.—MEANS OF MONTHLY MEAN TEMPERATURE, GREENWICH, 1841-1890.

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
38·53	39·50	41·68	47·17	53·10	59·44	62·45	61·61	57·19	50·01	43·21	39·6

It will be seen that over barely three months of the year, on the mean, is plasmodial viability possible. In twenty-one years of this fifty-year period the temperature over the three months of June, July, and August reached 59° F., at which plasmodial development possibly might occur. In actually only seven of these fifty years, however, was the monthly mean reached by the three months coincidentally; and of these, *three were consecutive years—1857-58-59.* The year 1856 immediately preceding had also a mean temperature over 59° F. in the three months under consideration. In these three years, in addition, the continuity of elevated temperature extended in each year over four months, with the exception of the last month in the series—September, 1859. *The year 1860 immediately succeeding was a year of abnormally low temperature, even in the months of July and August, the mean reaching only 58° F.* The maxima, minima, and means, as recorded at the Royal Observatory, Greenwich, are here given for the quinquennium embracing the years discussed, as well as the means for the period 1841 to 1905.

TABLE II.—MEAN MONTHLY MAXIMUM TEMPERATURE OF THE AIR, 1856-60, AND MEAN, 1841-1905.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1841-1905	43·05	45·24	49·83	57·18	63·94	70·73	74·15	72·72	67·31	57·48	48·97	44·24
1856	43·8	47·4	45·7	57·4	59·1	70·8	73·3	75·9	65·5	59·9	47·1	45·1
1857	41·8	47·2	50·2	55·8	67·1	76·0	77·8	78·1	70·2	61·6	51·9	50·3
1858	43·6	41·8	50·7	57·6	63·7	79·5	73·9	75·6	70·9	59·9	46·1	45·2
1859	45·5	50·4	54·2	56 9	64·9	73·9	81·8	76·1	67·1	59·0	49·4	41·5
1860	45·0	42·5	49·2	53·7	65·5	65·0	69·2	67·2	63·4	58·6	46·7	40·6

TABLE III.—MEAN MONTHLY MINIMUM TEMPERATURE OF THE AIR, 1856-60, AND MEAN, 1841-1905.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1841 1905	33·61	34·29	34·99	38·93	43·70	49·87	53·10	52·99	49·14	43·29	37·56	34·78
1856	35·2	37·6	33·3	38·3	42·6	50 0	52·4	54·7	47·6	45·8	35·1	35·3
1857	32·1	32·5	35·9	38·8	44·0	50·5	54·3	56·4	52·1	47·1	40·6	39·6
1858	31·7	29·8	33·6	38·0	42·7	53·9	51·9	52·1	52·5	43·9	33·6	36·6
1859	35·5	36·3	40·5	39·1	43·9	53·0	57·2	54·4	49·0	45·0	35·5	31·8
1860	34·8	30·1	35·0	35·6	44·6	48·5	50·2	51·8	45·8	44·5	35·3	32·0

TABLE IV.—GREENWICH—MEAN MONTHLY TEMPERATURE OF THE AIR, 1856-60, AND MEAN, 1841-1905.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1841-1905	38·58	39·52	41·87	47·29	53·04	**59·44**	**62·65**	**61·63**	57·27	49·97	43·50	39·94
1856	39·2	42·1	39·1	47·5	49·9	**59·7**	**61·6**	**63·7**	55·2	52·0	41·0	40·2
1857	36·8	38·9	41·9	46·3	54·3	**62·5**	**65·1**	**65·7**	**59·9**	53·2	46·0	45·1
1858	37·6	34·9	41·5	46·8	52·2	**65·7**	**61·4**	**62·3**	**60·4**	51·2	39·5	41·1
1859	40·5	43·4	46·8	47·5	53·5	**62 3**	**68·9**	**63·9**	57·0	51·4	42·1	36·7
1860	40·0	35·7	41·5	48·3	54·6	55·7	58·3	58·2	53·7	51·2	41·0	36·4

In association with these years there is a remarkable series of "record" temperatures for the period 1841 to 1905. In 1860 there are lowest mean maxima in June and August, and a lowest mean for the month of April. There are highest mean monthly minima in August, 1857, and March and July, 1859. There are highest monthly means in August, 1857, May, 1858, and March and July, 1859. There are various other "records" established in the temperature of these years, and in general consideration the following extract from the records of Greenwich Observatory tend to emphasize them :—

"The number of days in the year on which the temperature rose to 70° or above varied from *28 in 1860*, and 30 in 1879, to 98 in 1861; *100 in 1857, 103 in 1859, 104 in 1858*, 108 in 1846 and 1868, and 132 in 1865. The well remembered cold summers of 1860 and 1879 are remarkably low in number of warm days—28 and 30 respectively, the next higher number being 49 in 1888."

No other consecutive continuity of elevated temperature of such extension is to be found in the records of temperature from *1763 to 1919*. The years 1825 and 1826, and the years 1808 and 1809 are the nearest approach, and there have been isolated years with increase, and some with prolonged increase, of temperature above the normal. *But this quinquennium, during the four years 1856-59, presents a seasonal malaria potentiality far beyond normal, and finishes in 1860 with a phenomenally cold year, in no month of which was a mean temperature attained for plasmodial development, and in only a few isolated days.*

Coincident with these temperature conditions we have the last and most authentic record of the widespread and intense occurrence of malaria in England.

The Thames Valley has here been taken as the latitude for general consideration of temperature and malaria occurrence, for the reasons that most reliable record of malaria is there obtained, and that the temperature of Greenwich represents practically the south of England, while it differs little from that of the fen counties where also malaria is recorded.

On proceeding further north, the evidence of the occurrence of indigenous malaria is scantier, and the 60° F. isotherm passes near York and Hull, north of the Humber in latitude about 54·30° N.

The averages of daily maximum, minimum, and mean temperature for the forty years 1871-1910 are here given for York and Scarborough, situated about the suggested extreme northerly range of indigenous malaria in England; of Cally, the most southerly official recording station, and of Dumfries, the situation of highest mean, in Scotland; and of Roche's Point, the most southerly official recording station, and of Dublin, the situation of highest mean, in Ireland.

TABLE V.—AVERAGES OF DAILY MAXIMUM, MINIMUM AND MEAN TEMPERATURE FOR CERTAIN MONTHS OF THE YEAR. (1871-1910, FORTY YEARS).

Month.

	June			July			August			September		
	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean
York ..	66·3	48·6	57·5	68·9	52·1	**60·5**	67·9	51·5	**59·7**	63·4	47·5	55·5
Scarborough	61·8	49·3	55·6	65·8	52·7	59·3	65·1	52·5	58·8	61·2	49·6	55·4
Cally ..	64·0	47·0	55·5	65·6	49·8	57·7	64·4	49·13	56·9	60·5	46·0	53·3
Dumfries (35 years) ..	65·8	47·5	56·7	67·0	50·4	58·7	66·1	49·8	58·0	62·4	45·8	54.1
Roche's Point (35 years) ..	63·0	51·4	57·2	65·2	53·8	59·5	64·9	53·8	59·4	61·8	51·3	56·6
Dublin (City)	64·3	51·2	57·8	66·7	54·1	**60·4**	65·8	53·6	**59·7**	61·7	50·2	56·0

On the assumption then that a mean temperature of about 60° F. is and has always been essential to the indigenous propagation of malaria, it is evident from the records of temperature that in most years a brief period of propagation is presented in a certain area of England mainly south of the Humber; that cold years occur in which indigenous propagation is practically impossible unless under conditions of artificial heating; that in Scotland normally under natural conditions malaria propagation cannot take place; and that in Ireland the postulated temperature is attained for but a brief period of the year in the city of Dublin.

In considering the relation of temperature to malaria, only the direct effect of heat on the incubation of the protozoa has so far been taken into account, and most stress has been laid on what may be termed the potentially viable months of June to September. There are many other actions of temperature which would no doubt have a modifying influence, but would not have any gross effect on the indigenous production. The influence of the temperature of winter months on the incidence of anopheles may at periods produce an effect of importance. Different ratios of association between temperature and humidity may have different results. But the main effect would be evident, in the direct dependence of indigenous malaria on a certain mean temperature of definite extent and with a certain degree of continuity.

If it is granted that in most years there is attained, in a considerable area of England, temperature sufficiently high to permit incubation of malaria protozoa, it might seem to follow that, in the presence of anopheles, malaria would persist endemic within that area. There are other factors besides temperature concerned, however, and there are other conditions of temperature required as well as mere elevation. These chiefly are extent and continuity. It is probable, from epidemiological observation, and in the absence of sufficiently extensive laboratory investigation, that about sixteen days continuously presenting a mean of 60° F. are necessary for the protozoal development under consideration. If that continuity is interrupted by lower means of temperature, the necessary extent of days may be much lengthened. The range of temperature again may influence development, and acceleration or retardation result, according to the exiguity or magnitude of the range, and the elevation or depression from the mean. There is evidence, certainly, that low temperature may retard without preventing development.

A very vital factor in the maintenance of endemicity in England is one that is corollary to temperature, that is, *the number of malaria carriers capable of infectivity in a succeding season.* It is obvious that variations in the temperature conditions, seasonally and from year to year, will affect the proportion of viable infectivity. In the extreme series of years, which we have discussed, it is clear that the period of necessary "carrier" continuity was in each of three successive years reduced by from two to three months below the normal. If in normal years "carriers" whose infectivity commenced only in August or September may not again under normal conditions infect a mosquito till the succeeding July or August, the number of "carriers" will be less after eleven months than after seven or eight. In the years 1857-1859 the biting, incubating and infective periods were extended, and the "carrier" recovery period reduced. The result was, increased incidence of malaria and more widespread occurrence than was on record in the thirty previous years. These years were followed by the cold year 1860, in which malaria is recorded as would be natural, by relapses from infections of the previous three years. But traditionally and officially malaria disappeared with suddenness about 1860, and only on intimate investigation is evidence of its sporadic lingering, especially in the Thames valley, to be obtained. Such evidence, too, is invariably open to the alternative explanation of successive importation of "carriers," an occurrence of comparatively frequent demonstration.

From this study of past-time occurrence, in the light of present knowledge of malaria, we may pass to view the present malaria condition in England, which has been affected by such wholesale importation of carriers as never before occurred in history.

Malaria "carriers" in large number began to arrive in the British Isles in the autumn of 1916, and have continued to come into and be distributed throughout the country during 1917, 1918, 1919. The first outbreaks of

malaria were detected in early *July*, 1917, in two centres in the Thames valley. The numbers, which under the circumstances are probably a minimum, officially recorded are 200, of which a few were scattered over some part of England, the greatest number occurring in Sheppey and at Sandwich, areas of marshland and abounding in *Anopheles maculipennis*.

In 1918 malaria occurred in *August* and the numbers were eighty-six, relatively distributed somewhat similarly as in 1917.

In 1919, on November 1, the number of cases officially recorded as indigenous malaria is about forty, of which the great majority occurred in *early September* in the situations of previous recent outbreak and of aforetime and traditional occurrence, the Isle of Sheppey.

The dates of outbreak in these three years are interesting in that they directly follow about a month after the commencement of a period of more or less continuous temperature of a mean of 60° F. The number of cases likewise varies directly with the extent of this mean temperature, which roughly in the years 1917, 1918, and 1919 was in the ratio 3 : 2 : 1.

The mean daily temperature of the air at Ramsgate is shown for the malaria-vital months of June, July, August, September in these recent years in Table VI; and in Table VII the same data are presented for the quinquennium 1856-1860 at Greenwich.

The extent and continuity of a mean temperature of 60° F. are to be seen in their relativity over the three years. Malaria propagation at the latitude of the records was possible over the area of England previously delineated, during the three years in varying intensity. Malaria cases occurred in this area in all three years, the farthest north report coming from Grimsby just south of the Humber, in 1918. The date of occurrence of the cases was in each year about a month after the commencement of a period of approximate continuity of a mean temperature of 60° F., which commenced about a month later in each year. The number of cases of malaria corresponds roughly to the extent of the valid temperature period, being largest when the period is longest in 1917, and smallest when the period is shortest in 1919.

Several other facts of interest are evidenced in these occurrences of malaria in England. In all indigenous cases the protozoan found has been the *Plasmodium vivax*. Evidently, therefore, a temperature which usually occurs in England in some part and for some period each year suffices for the incubation of the parasite of benign tertian malaria within *Anopheles maculipennis*, which there is ample evidence to accept as the common vehicle of transmission in England. On epidemiological grounds, chiefly concerned with the region and season of occurrence of quartan and malignant tertian fevers, there is reason to assume that a temperature suitable for the propagation of the *P. falciparum* and the *P. malaria* has not been present in England in 1917, 1918 and 1919. Other factors may have effect, number of carriers and situation especially.

Out of the whole indigenous occurrences of 1917 and 1918 there is no

TABLE VI.—Mean Daily Temperature of the Air at Ramsgate for the Years 1917-19, in the Months of June, July, August and September.

Month of June.

Day	1917	1918	1919
1	57·5	59·5	53·5
2	59·0	58·0	53·0
3	55·0	58·0	53·5
4	57·5	53·5	52·0
5	62·0	53·5	60·5
6	56·5	57·0	62·0
7	64·0	56·5	61·5
8	63·0	57·0	62·5
9	62·0	56·5	59·0
10	55·0	51·5	58·0
11	67·4	56·5	62·5
12	61·5	56·0	63·5
13	65·5	61·0	58·5
14	61·5	58·5	57·0
15	60·0	56·0	57·5
16	65·0	52·0	63·5
17	67·0	52·0	59·0
18	72·0	57·0	58·5
19	65·0	58·0	60·5
20	63·5	57·0	60·0
21	57·5	59·5	57·5
22	55·5	58·5	56·5
23	54·0	55·5	56·5
24	58·5	52·0	53·5
25	59·0	51·5	52·5
26	58·0	53·0	50·0
27	56·0	55·5	53·0
28	61·0	59·0	61·5
29	59·5	58·5	57·0
30	53·5	57·0	51·5
Mean of month	60·1	56·2	57·5

Month of July.

Day	1917	1918	1919
1	57·0	60·5	50·5
2	58·0	60·0	52·0
3	60·0	57·5	54·5
4	60·5	56·0	57·0
5	55·5	61·5	59·5
6	56·0	62·0	55·5
7	59·0	62·0	53·5
8	59·0	61·0	57·0
9	57·0	58·5	56·5
10	57·0	57·5	56·5
11	56·5	56·5	58·0
12	59·5	59·0	60·0
13	65·0	57·0	56·5
14	67·5	56·5	55·5
15	64·5	64·0	53·5
16	61·0	68·0	56·5
17	60·5	62·0	60·5
18	62·0	61·5	61·5
19	66·5	61·5	63·5
20	65·0	62·0	60·0
21	61·0	62·0	58·5
22	58·5	61·0	60·0
23	65·0	62·5	58·5
24	67·5	59·5	58·5
25	66·0	60·0	57·5
26	63·5	59·0	54·5
27	66·5	57·0	55·0
28	64·5	57·5	56·5
29	63·0	60·0	53·5
30	60·0	62·5	55·0
31	59·5	62·0	58·5
Mean of month	61·0	60·2	56·9

Month of August.

Day	1917	1918	1919
1	58·0	61·0	63·5
2	58·5	61·5	66·5
3	59·0	60·0	60·0
4	54·5	60·0	59·5
5	62·5	60·0	62·5
6	62·0	59·0	63·0
7	61·5	58·0	58·5
8	61·5	60·5	61·5
9	59·0	61·0	67·0
10	61·0	60·0	68·5
11	62·0	62·0	63·5
12	61·5	64·5	68·5
13	62·5	63·5	66·0
14	62·5	64·0	68·5
15	60·0	61·5	61·5
16	61·5	62·5	66·5
17	60·5	60·5	68·0
18	63·0	64·0	65·5
19	62·0	60·5	66·5
20	58·5	64·5	66·5
21	58·5	68·0	61·5
22	64·5	73·5	57·5
23	63·5	62·0	62·0
24	60·0	61·0	60·5
25	60·0	61·0	58·0
26	58·5	61·5	62·0
27	57·0	57·5	59·0
28	58·0	60·0	57·5
29	58·5	58·0	51·0
30	57·5	58·0	56·0
31	58·0	58·0	56·5
Mean of month	60·3	61·5	62·7

Month of September.

Day	1917	1918	1919
1	58·0	56·0	55·1
2	57·5	55·5	61·0
3	57·0	56·0	62·0
4	58·5	57·5	62·5
5	60·5	60·0	66·5
6	61·5	61·5	66·0
7	61·5	60·0	60·0
8	61·0	60·5	63·5
9	57·5	54·5	62·5
10	60·0	59·0	65·5
11	60·5	55·5	70·5
12	58·5	56·0	71·5
13	56·0	55·0	61·0
14	58·5	56·0	61·5
15	57·5	62·5	60·0
16	59·0	62·5	60·5
17	61·0	62·0	60·5
18	61·5	62·5	59·5
19	63·0	61·0	57·0
20	59·5	53·5	45·0
21	54·5	56·5	47·0
22	55·5	57·5	51·5
23	57·0	56·0	53·0
24	59·0	53·0	57·5
25	61·0	55·0	58·0
26	60·0	53·5	59·5
27	57·5	53·5	51·0
28	55·0	51·5	51·0
29	58·0	47·5	52·0
30	57·0	48·5	50·0
Mean of month	58·2	56·7	58·6

TABLE VII.—MEAN DAILY TEMPERATURE OF THE AIR AT GREENWICH FOR THE QUINQUENNIUM 1856-60, IN THE MONTHS OF JUNE—SEPTEMBER.

Month of June.

Day	1856	1857	1858	1859	1860
1	52·4	55·0	71·5	61·1	56·0
2	57·9	57·6	68·9	61·6	53·6
3	62·2	58·8	70·8	62·9	53·7
4	63·0	63·6	65·0	65·7	54·1
5	56·1	68·1	60·4	64·7	52·0
6	53·7	69·3	61·4	62·2	52·2
7	59·2	62·9	59·4	62·7	51·6
8	61·1	57·9	64·6	64·3	54·7
9	62·3	55·8	69·3	62·2	51·6
10	62·5	56·1	65·3	59·2	53·4
11	60·1	55·7	66·4	61·4	55·0
12	57·5	54·1	66·9	61·3	54·8
13	58·9	54·4	67·7	64·1	54·7
14	55·5	55·2	72·8	58·0	54·1
15	56·2	57·5	74·4	61·0	54·6
16	59·4	57·6	77·3	58·5	57·8
17	57·1	61·3	65·7	58·9	52·7
18	58·7	59·7	57·5	62·4	57·2
19	54·0	66·0	63·5	62·3	54·9
20	55·8	69·9	62·6	59·2	59·4
21	55·6	67·4	64·6	57·9	58·2
22	59·2	62·7	69·2	65·0	58·6
23	57·4	67·4	69·0	61·8	61·2
24	60·7	68·7	63·3	60·2	63·1
25	66·8	68·4	63·5	64·3	59·6
26	69·4	69·3	66·7	70·1	57·9
27	72·8	72·2	61·0	69·8	57·7
28	65·6	74·5	60·3	64·4	58·1
29	59·7	65·5	60·8	60·9	55·7
30	61·3	61·9	63·1	62·3	53·7
Mean of month	59·7	62·5	65·7	62·3	55·7

Month of July.

Day	1856	1857	1858	1859	1860
1	57·7	60·1	58·6	60·5	57·4
2	57·5	58·0	55·4	63·0	61·9
3	56·9	60·6	55·6	67·7	62·9
4	60·1	61·3	58·2	67·0	61·7
5	61·8	61·9	57·9	63·3	60·1
6	63·9	60·1	57·9	70·2	59·2
7	57·4	56·8	55·4	69·9	56·0
8	50·8	57·0	56·0	69·5	56·1
9	54·1	60·2	55·0	68·2	56·9
10	58·8	62·6	56·6	70·1	54·6
11	61·4	65·4	64·6	72·4	50·0
12	61·6	68·2	66·7	76·8	59·2
13	59·5	70·3	64·1	75·5	58·8
14	60·6	70·8	67·8	66·0	61·4
15	64·7	72·2	73·4	69·0	63·3
16	59·4	66·4	65·6	72·2	59·0
17	59·1	63·7	66·7	74·1	61·3
18	58·6	67·0	64·1	74·3	59·1
19	64·6	69·6	63·6	71·9	58·2
20	52·7	70·1	65·2	68·2	59·1
21	63·5	64·2	62·3	68·0	57·0
22	66·4	66·9	60·4	68·7	57·7
23	69·6	72·0	65·0	63·0	54·8
24	65·4	70·3	62·3	61·3	56·2
25	62·5	66·9	62·2	62·9	54·8
26	62·0	64·0	61·2	69·6	54·6
27	59·9	65·7	60·6	70·9	57·6
28	62·6	65·0	59·6	72·6	56·5
29	66·0	65·2	57·6	69·7	57·0
30	68·6	65·9	61·1	66·6	57·5
31	72·4	70·3	61·8	68·3	58·3
Mean of month	61·6	65·1	61·4	68·9	58·3

TABLE VII—*continued.*

Month of August.

Day	1856	1857	1858	1859	1860
1	71·1	67·7	61·3	64·3	59·5
2	73·9	69·4	60·0	63·5	57·9
3	72·7	72·2	65·0	65·6	59·7
4	68·4	72·1	63·4	66·5	60·7
5	65·4	66·1	66·2	61·1	58·3
6	62·9	63·2	66·1	61·1	57·6
7	67·2	58·1	61·4	68·3	56·0
8	62·8	57·1	61·3	68·3	55·3
9	64·6	60·5	63·4	60·1	57·1
10	70·2	63·3	66·0	58·3	57·0
11	70·2	66·5	68·1	62·5	59·2
12	67·3	67·4	71·3	65·8	58·3
13	68·7	69·2	67·7	66·8	58·2
14	64·4	62·5	61·6	65·2	58·8
15	63·8	58·7	61·8	60·6	59·8
16	62·2	68·8	62·9	59·9	61·7
17	62·2	62·7	66·6	61·8	56·5
18	58.1	62·6	67·4	67·0	54·5
19	58·3	65·4	66·9	67·7	59·5
20	59·3	65·0	61·8	68·6	60·6
21	59·9	64·3	56·4	64·4	59·3
22	58·5	69·3	61·6	63·7	56·8
23	53·3	71·9	62·1	66·7	55·9
24	59·2	73·0	63·5	67·6	55·8
25	61·0	69·6	60·2	72·3	60·5
26	61·5	66·3	57·0	66·7	60·2
27	64·0	66·4	58·5	64·8	57.1
28	61·0	61·6	56·1	60·2	57·1
29	62·0	61·1	55·8	61·3	59·6
30	58·9	67·5	58·2	55·1	59·5
31	63·0	66·2	59·9	53·7	57·3
Mean of month	63·7	65·7	62·3	63·9	58·2

Month of September.

Day	1856	1857	1858	1859	1860
1	57·7	64·7	59·1	56·0	56·3
2	55·3	56·4	58·1	58·1	54·4
3	55·1	53·8	65·6	60·3	55·2
4	56.5	56·4	63.3	56·9	55·4
5	54·9	59·5	57·3	57·2	56·9
5	57·7	61·2	55·5	59·3	57·8
7	58·2	61·0	58·3	57·6	56·5
8	56·9	61·8	61·4	61·1	58·3
9	58·1	60·5	59.0	61·6	53·2
10	63·4	62.9	63·1	54·9	48·7
11	61·2	57·5	63·6	54·9	49·5
12	59·1	59·7	65·1	57·1	50·5
13	55·3	60·4	64·6	52·6	53·6
14	54·3	60·2	63·6	50·8	56·9
15	56·9	62·0	62·7	52·9	55·3
16	58·2	65·8	62.5	54·2	55·9
17	57·1	66.0	63·6	55·2	60·0
18	54·3	62·4	59·8	52·2	53·6
19	50·0	57·3	53·7	55·8	51·9
20	48·8	57·7	59·4	53·8	55·1
21	50·6	55·5	59·1	54·1	56·7
22	53·4	57·8	63·2	53·9	56·3
23	54·2	59·5	63·0	58·7	50·4
24	53·5	61·6	58·3	67·0	48·9
25	51·9	62·5	54·8	62·8	47·4
26	52·1	53·3	57·0	60·3	49·8
27	52·4	61·9	59·6	57·0	54·4
28	51·6	58·2	57·5	59·0	52·0
29	53·1	55·9	61.1	56·3	50·9
30	53·6	57·8	60.3	57·5	50·2
Mean of month	55·2	59.9	60·4	57·0	53·7

proof that any indigenous victim handed on infection in the succeeding year. Military cases were investigated, and none was a source of infection to other indigenous cases ; and of the civilian cases of 1917, only 30 per cent were probable carriers in the infectious area in 1918, and none was proved to be an actual carrier.

Study of Table VII will show the unusual extension and elevation of temperature beyond the mean in the greater part of the quinquennium 1856-60, as well as the practical absence of the possibility of natural malaria infection in the cold year 1860.

There is coincidence of circumstance in these two periods of malaria occurrence in England, which present the latest and well authenticated outbreaks. In both periods the importation of malaria carriers has been great, though undoubtedly greater in the recent period. In both periods the occurrence of indigenous infection may without hesitation be admitted ; but in the previous period the cases were probably much more numerous, to judge from the records and tradition. The former period had fewer imported carriers, but a higher and much more extensive high temperature in three successive years. These years were followed by a very cold year, and sudden cessation of official recognition of epidemic malaria.

The conclusions to be drawn from the study of the relation of temperature to malaria occurrence in England are that the elevation of temperature necessary for the propagation of malaria does not occur with the certain regularity of extent and continuity which is necessary to maintain endemicity ; and that indigenous occurrence depends on "carrier" importation which in sufficient volume, in the presence of abnormal extent of high temperature, may engender epidemic and initiate a temporary endemicity, limited in area and years. This would appear to be the natural inference to be drawn from the study of the facts in relation to the occurrences in 1856-1860 and 1917-1919.

There are certain factors—the manner of living of the people ; the nature of housing of man and animals ; the extent and nature of agriculture ; drainage of the soil ; medicinal control of the disease—which undoubtedly must have modified the course of malaria in the British Isles. So far as temperature is concerned, it seems improbable that malaria ever existed continuously in these islands, or that any but the benign infection has had indigenous origin in England.

The experience of armies in the years 1916-17-18, on the various fronts where malaria abounds endemic, shows the definite relation between temperature and the onset of malaria ; and likewise indicates the relative dependence on temperature of the development of the *P. vivax* and the *P. falciparum.* Table VIII shows the mean temperature for the three years, less two winter months in 1916 and in 1918, calculated from records, in War Office Reports, which show the mean daily maxima and minima for Salonika Town. It will be seen that a mean temperature of over 60° F. is available for six months in each of these years, and probably extends into

the end of April and the beginning of November as well. Although there are four cold winter months the infective period is obviously one of from six to eight months. The volume of infection, given parity of conditions otherwise, must be calculably much greater the longer the extent of the infective period; and in a country where such continuity of elevated temperature is annually present, the maintenance of endemicity is to be expected. The number of active carriers after four or five months is sufficient to keep the fire alight.

In Macedonia, infection with the *P. vivax*, benign tertian malaria began to be manifested about May 20, 1918, and with the *P. falciparum* about July 20, 1918. This seasonal relativity of occurrence of "benign" and "malignant" tertian malaria is recorded in other parts of the world. The inference is that the *P. falciparum* requires a longer continuity of elevated temperature; or a higher temperature, or higher temperature longer continued, than does the *P. vivax*. No one has shown that a different mosquito is necessary for the propagation of the different parasites.

No observations of sufficient extent have been made of the seasonal and relative occurrence of infections of *P. malariæ*, so that its relation to temperature awaits further study. The recorded experience amongst British troops in Macedonia, in regard to quartan malaria, is that the incidence of quartan malaria in the Army was surprisingly low, when compared with what was regarded as a high incidence amongst the civilian population. The observations were, however, limited, and are insufficient to support any generalization. The most noteworthy fact, which remains to be explained, in connexion with the *P. malariæ* is its extremely locally limited distribution. Whereas in one district an observer may record a malaria infection almost wholly of *P. malariæ*, a wide area of country around filled with infection of *P. falciparum* and *P. vivax* may fail to yield any record of *P. malariæ*. This has been remarked by observers in India, Africa, and the West Indies. The possible explanations are many; the truth is yet to seek.

TABLE VIII.—SALONIKA TOWN.

Mean Daily Temperature.

(Calculated from records of mean Daily Maxima and Minima—War Office Reports.)

	1916	1917	1918
January	—	48·2	44·0
February	—	44·2	44·8
March	55·7	54·3	48·7
April	58·0	53·0	58·2
May..	**67·2**	**65·0**	**69·0**
June	**78·0**	**75·0**	**72·5**
July..	**80·2**	**79·0**	**80·0**
August	**76·5**	**81·2**	**80·0**
September	**69·7**	**73·7**	**77·5**
October	**62·5**	**65·5**	**65·5**
November	58·0	55·5	—
Decemeer	53·5	48·7	—

The temperature conditions, which have here been considered, have been what may be called the natural conditions as evidenced by official meteorological records. In civilized life in temperate lands, however, there must also be dealt with conditions depending on that civilization, which may be looked on as artificial, in that they depend on the manner of the necessary indoor life of man. It is notorious that mosquitoes come in contact with man in his domestic life, and their bionomics are thereby modified. The normal habitat of *Anopheles maculipennis* in England is, throughout the year and practically exclusively throughout nine months of the year, in occupied stables, piggeries, and byres, where warmth, shade, shelter, and food are available. In the warm months of summer the mosquitoes, as they are bred, wander under cover of any sort, and are now found in dwelling houses, open sheds, unoccupied stables and barns, where also now the favouring conditions above mentioned are obtained. In these months easy contact with humanity enables the dissemination of malaria, where the "carrier" is present and the natural temperature sufficiently high and continuous.

Besides this summer intrusion, however, into the homes of man, entomological records show that occasional anophelines may be found in England in houses later in the year, though normally they are now resting in a sluggish condition in the buildings occupied by cattle. There is also record of the domestic visitation of anophelines in the months of spring—March to May and June—in small number, but evidently definitely associated with bright sunny weather when they are tempted to leave their winter quarters for the purpose of egg-laying.

In England, in the spring months of 1918, cases of malaria of undoubted indigenous origin occurred, of which the infection had to be referred to an early spring infection by anopheline mosquitoes in whom plasmodial development had been brought about by incubation at the indoor temperature of occupied and artificially heated rooms. In all military cases conditions undoubtedly existed for this occurrence. The conditions, so far as concerned the mosquito, were identical with the laboratory conditions arranged in temperate countries for the investigation of malaria infection. In all instances, too, a carrier of malaria was in immediate contact with the indigenous case. Table IX is presented, which shows a series of calculated mean temperatures over the period in which infection of these indigenous spring cases must have occurred. The calculation is of the mean of sixteen-day periods, from April 19, 1918, to May 15, 1918. It is evident that at natural temperature in either of the areas where infection occurred, protozoal development within the mosquito would require to have gone on at a mean temperature, ranging from 44° F. to 51° F. There is sufficient epidemiological and laboratory evidence to negative the possibility of such occurrence. In all instances of occurrence the fact of anophelines being present and having been abroad at the time, was obtained in conjunction with the

presence of a potent carrier and the availability of a heated chamber which gave a continuous mean temperature well above the temperature of normal natural infection.

TABLE IX.—MEAN TEMPERATURE OF THIRTEEN 16-DAY PERIODS.
(Calculated from the records of the Meteorological Office.)
ENGLAND.

Station A. East Coast				Station E. Midlands			
Period	Maximum	Minimum	Approx. mean	Period	Maximum	Minimum	Approx. mean
1918				1918			
April 19 to May 4 ..	50	41	45	April 19 to May 4 ..	52	37	44
,, 20 ,, ,, 5 ..	51	42	46	,, 20 ,, ,, 5 ..	53	38	45
,, 21 ,, ,, 6 ..	52	42	47	,, 21 ,, ,, 6 ..	54	39	46
,, 22 ,, ,, 7 ..	52	43	48	,, 22 ,, ,, 7 ..	55	40	47
,, 23 ,, ,, 8 ..	52	43	48	,, 23 ,, ,, 8 ..	55	40	48
,, 24 ,, ,, 9 ..	53	43	48	,, 24 ,, ,, 9 ..	56	40	48
,, 25 ,, ,, 10 ..	53	43	48	,, 25 ,, ,, 10 ..	56	40	48
,, 26 ,, ,, 11 ..	53	43	48	,, 26 ,, ,, 11 ..	56	40	48
,, 27 ,, ,, 12 ..	53	43	48	,, 27 ,, ,, 12 ..	56	40	48
,, 28 ,, ,, 13 ..	53	43	48	,, 28 ,, ,, 13 ..	56	40	48
,, 29 ,, ,, 14 ..	54	43	49	,, 29 ,, ,, 14 ..	57	40	49
,, 30 ,, ,, 15 ..	55	44	50	,, 30 ,, ,, 15 ..	58	41	50
May 1 ,, ,, 16 ..	56	45	51	May 1 ,, ,, 16 ..	59	42	51

How far the occurrence of spring infection, in this manner, may go to explain the historic recognition in past days of a spring outbreak of ague, often more extensive and severe than the autumn outbreak, it is not safe to say, since it has already been suggested that diseases treated as agues and malarias, one and two hundred years ago, were many more than the one entity we are able to recognize as malaria to-day. With the different conditions of living which undoubtedly existed in the eighteenth and early nineteenth century, when in country parts domestic cattle were housed in much greater intimacy with humanity than now, it is but natural to expect that in the spring months there would be more ready opportunity for the biting of humans and more chance of indoor temperature incubation.

Ordinarily in modern domestic life a spring wandering anopheline will not remain in the cold sleeping quarters of a house, and does not find the diurnal changes of temperature of living rooms or their disturbance congenial; but where in past days the temperature may have been maintained by the dwelling of cattle and humans under the same roof and ceiling, and where, as in the recent indigenous occurrences described, the needed temperature was known to be maintained in military huts and in hospitals, the possibility of infection is evident.

In this connexion it may be further suggested that even in Scotland and in Ireland, in districts where anopheline mosquitoes were present, the occurrence of indigenous infection in spring, within the buildings which

afforded common shelter for animals and man, may have been sufficiently frequent to justify the recognition of seasonally recurrent malaria. It is probable that bloodsucking is at a minimum during the winter months of mosquito dormancy. Observation on the longevity of *A. maculipennis* captured and caged, amongst numerous others at large, in a stable in Kent in the winter of 1918-19, showed that the mosquitoes caged and so prevented from getting a feed of blood were all dead within thirty days, while the stable still harboured thousands of others free in full vitality till the spring months. Low ranges of temperature in winter also would limit the chances of incubation in the mosquitoes sheltering, as is their custom, on the rafters. The advent of spring, however, awakens the mosquitoes, which commence egg-laying in March and April, and in these months their bloodsucking is observed to be more frequent and energetic. In these same buildings it is obvious that the chances of infection would be less in the summer months. The cattle would be rarely housed, fires would be reduced, and the indoor temperature would naturally approximate to the natural temperature, which does not reach the necessary height for protozoal incubation for a sufficient length of time.

The complete study of all the factors determining the occurrence and incidence of malaria in temperate countries may be profitable work for the authorities interested in those countries where there is history and tradition of malaria. The temperature factor has here been dealt with in the light of modern knowledge of the nature of the disease. The other factors are many; the evidence does exist of the previous occurrence of malaria, in parts where now it does not occur, except from importation; the evidence that these occurrences were indigenous may not be said seriously to be clear; the evidence that physicians of the sixteenth and seventeenth century in England dealt with the entity malaria as we distinguish it to-day is not sound; that these physicians included other diseases under ague is certain. So that for any one setting out to attempt a solution of the problem of the actuality of the former extent of malaria, indigenous in origin, in the British Isles alone, there is much study inevitable. Certain it is that in any such study the effect of temperature on the occurrences of to-day, and the recognition of the temperature influence on malaria of the past, cannot be ignored.

In Table X are presented some interesting figures kindly supplied by Major J. E. M. Boyd, R.A.M.C.

Primary infections are not differentiated, and the numbers are too few to justify any conclusions. They may safely be accepted, however, as confirming other epidemiological evidence. The relation of *falciparum* infections to a higher temperature than *vivax* infections seems to be indicated; and in the years 1911 and 1912 the suggestion seems to be that the maintenance of a mean temperature of much over 90° F. prevents *falciparum* infection. The comparative absence of malaria in excessively hot seasons (usually hot and dry) is a matter of common recognition.

TABLE X.—FEROZEPORE. PUNJAB. STATION HOSPITAL, 1909-13.

Temperature and Rainfall, Strength, Admissions for Certain Diseases (Malaria Diagnosis from "Parasites found").

(Authority of Major J. E. M. Boyd, R.A.M.C.)

1909.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature °F.—												
Maximum ..	..	..	..	..	..	..	..	..	94	92	..	..
Minimum ..	..	..	..	..	..	..	..	..	76	82	..	..
Mean	..	..	..	..	..	..	..	..	85	87	..	..
Rain in inches ..	..	..	..	..	..	3·0	3·41	2·53	4·58	..	..	..
Strength of garrison	1,245	1,220	1,239	1,030	797	790	778	785	829	870	1,239	989
Malaria—												
P. vivax ..	11	3	18	36	18	53	91	61	19	9	5	17
P. falciparum ..	45	26	19	9	3	3	—	6	20	96	50	82
Pyrexia of unknown origin	1	1	5	24	23	10	16	25	12	1	5	5

1910.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature °F.—												
Maximum ..	73	80	91	102	112	112	100	99	97	96	83	80
Minimum ..	54	63	63	83	85	76	81	81	82	84	73	61
Mean	63	71	77	92	98	94	90	90	89	90	78	70
Rain in inches ..	0·6	0·37	0·05	0·15	1·0	2·85	1·46	5·99	—	—	—	0·11
Strength of garrison	1,173	1,207	1,282	966	892	874	842	835	851	791	741	1,078
Malaria—												
P. vivax ..	2	12	9	6	17	22	36	23	31	19	12	8
P. falciparum ..	39	13	8	1	0	6	9	2	19	21	19	12
Pyrexia of unknown origin	5	3	9	11	8	6	5	13	9	2	1	1

1911.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature °F.—												
Maximum ..	73	81	84	95	113	112	111	109	105	103	86	76
Minimum ..	49	57	61	83	88	89	86	88	87	82	64	71
Mean	61	69	72	89	100	100	98	98	96	92	75	73
Rain in inches ..	4·05	0·10	3·51	0·32	0·50	1·51	0·97	1·55	0·25	0·30	0·53	—
Strength of garrison	1,028	1,272	1,309	1,110	899	910	919	916	912	999	1,027	906
Malaria—												
P. vivax ..	0	4	6	6	17	10	12	9	4	1	8	3
P. falciparum ..	5	6	2	1	1	1	1	0	0	0	0	0
Pyrexia of unknown origin	4	1	—	1	1	5	5	5	1	2	1	—
Sandfly fever (first diagnosed in 1911)	—	—	—	—	8	15	22	4	11	7	—	—

1912.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature °F —												
Maximum ..	75	87	95	104	115	115	107	101	101	101	88	78
Minimum ..	56	73	77	74	88	95	81	79	90	88	57	57
Mean	65	80	86	89	101	105	94	90	95	94	72	67
Rain in inches ..	2·02	—	2.8	1·28	0·26	0·63	2·23	6·91	—	—	1·5	—
Strength of garrison	1,299	1,057	1,188	1,133	955	944	933	937	921	1,065	635	677
Malaria—												
P. vivax ..	3	1	2	0	4	1	2	1	7	10	9	4
P. falciparum ..	0	1	—	—	0	3	1	0	7	7	1	0
Pyrexia of unknown origin	—	—	3	4	6	3	4	0	2	1	1	—
Sandfly fever (first diagnosed in 1911)	—	—	—	—	11	14	16	14	4	8	5	—

1913.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Temperature °F.—												
Maximum ..	80	78	90	99	108	107	100	101	99	98	84	76
Minimum ..	60	63	57	87	74	82	85	84	85	80	70	53
Mean	70	70	73	93	91	94	92	92	92	88	77	67
Rain in inches ..	—	1·43	1·62	—	1·07	2·53	6·45	5·02	1·65	—	—	1.55
Strength of garrison	1,146	1,218	1,213	1,044	946	933	909	920	937	1,035	1,238	1,102
Malaria—												
P. vivax ..	1	0	1	1	1	4	2	15	15	12	11	6
P. falciparum ..	0	0	0	0	0	3	2	1	14	12	13	21
Pyrexia of unknown origin	8	1	—	—	—	—	—	—	—	—	—	—
Sandfly fever (first diagnosed in 1911)	—	—	43	42	33	31	53	—	13	6	—	—

Summary.

Anopheline mosquitoes are widespread in England. Malaria has occurred in England in the past, though its continuous endemicity is in doubt.

The last authentic widespread occurrence was in the years 1856-60, when four years of abnormally high and continued high temperature coincided with the importation of many malaria carriers.

A great volume of malaria infection was introduced in the years 1916-19, when indigenous malaria occurred in the years 1917-18-19, in numbers proportional to the extent of a malaria incubative temperature which was limited.

There are years (example, 1860) when natural malaria infection in England cannot occur, presuming that a mean temperature of 60° F. for sixteen days, not remotely discontinuous, though compounded of a variety of maxima and minima, is necessary to establish infection, of which there is ample epidemiological and experimental evidence.

The normal temperature of England is insufficient to maintain malaria endemic under modern conditions of domestic life; although living conditions over 100 years ago may have allowed more ready infection, especially in spring, and given more evidence of temporary or discontinuous endemicity, even in Scotland where the natural temperature of infection does not normally occur.

Temperature decides infection and determines incidence; and the inability to prognosticate the temperature of any year compels the taking of preventive measures in England in face of a large importation of infection.

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TENDON TRANSPLANTATION AND FIXATION FOR NERVE INJURIES.

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Wounds of nerve trunks, with the paralyses resulting therefrom, have been numerous during the campaign in East Africa, and the application of the right treatment for each case, has been one of the most interesting of the surgical problems submitted to us. The station in life of each patient, his chances of being able to continue treatment after leaving hospital, and his ability or otherwise, to get efficient apparatus have all been factors in deciding on the class of operation applicable.

In the operative treatment of nerves and paralysed muscles in this Force we have been guided by the work of Major-General Sir Robert Jones on poliomyelitis, and we have successfully applied his methods of tendon-transplantation and fixation in cases unsuitable for nerve suture, or in cases in which nerve suture had failed. Many such operations on paralysed and useless limbs have been carried out, and though none can be said to have actually failed, there is no doubt that our later cases have been more uniformly successful as regards end results. The production of these improved results has been attained by certain modifications in our original methods, and I will endeavour to describe those modifications in the text and to explain their rationale.

Tendon Transplantation.—This operation has been carried out in this Force for three types of nerve injury :—

(*a*) Irreparable injury to the musculo-spiral nerve with wrist-drop.

(*b*) Similar injury to the median nerve.

(*c*) Injury to the musculo-cutaneous nerve in the leg with paralysis of the peronei muscles and resulting pes equino varus.

Before describing the operations carried out, and the modifications which we have found useful, let me state that in certain disabilities, due to severance of a nerve-trunk, and especially in the paralysis due to division of the musculo-spiral nerve, one is justified in recommending the operation of tendon transplantation in preference to that of secondary nerve suture. I think that this is probably the case even for British officers and men, while for the Indian and African soldier, and the porter, who want useful hands quickly, and who cannot, and in most cases certainly will not, carry out the long months of treatment essential for a successful result after nerve suture, I am certain that tendon transplantation is the operation of election. As regards usefulness to the Force, too, tendon transplantation is preferable, as it will return men with useful hands to the ranks in two or three months. Such a result is impossible after nerve suture.

In comparing the two operations for a case of drop-wrist, the proposition which the surgeon can lay before his patient is as follows: By nerve suture a perfect result is probable, but not certain; the result will be obtained after a year, or even two years, during which time the hand must be kept in continual extension, and electric treatment and massage must be energetically carried out. In the case of failure the operation of tendon transplantation is still available. By tendon transplantation a useful hand can be guaranteed after two or three months. It will not be a perfect hand, but it will do for holding and using a gun or rifle, digging, driving a motor car, and manual labour not involving fine movements of the fingers. I imagine that most men would choose the shorter time of waiting and the less perfect hand. A musician or a surgeon would consider the longer time not ill spent if he regained full use of his highly trained hand, but the majority of men would ask for quicker and more certain results.

That nerve suture, either primary or secondary, will certainly fail unless relaxation of the paralysed muscles is maintained, and may fail even with approved treatment, has been amply demonstrated to us by cases which have come into the base hospitals here for paralysis due to wounds in the early part of the campaign. The cases of two prisoners of war illustrate failure from lack of treatment after nerve suture. Both were wounded at the battle of Tanga in November, 1914; in both cases immediate suture of the musculo-spiral nerve was done by German surgeons, and from their account no further treatment of any sort was adopted. They were both taken prisoner some years later, and eventually reached the Prisoners of War Hospital at Dar-es-Salaam. Both these prisoners had typical dropped wrists and absolutely useless hands, and the scars of their wounds, and of the operations for suture of the trunk of the musculo-spiral were obvious in the upper arm. In one case a further operation of tendon transplantation had been attempted. The palmaris longus had been transplanted into the extensor tendons of the fingers, not of the thumb. This operation had absolutely failed to give any power of extension of the wrist—and, indeed, it could hardly be expected to do so. In both these cases the complete operation, as described below, was performed, and each man has now a useful hand, with power to extend and support the wrist, extension of the fingers and extension and abduction of the thumb.

Failure after primary nerve suture with continued treatment was illustrated by the case of a corporal of the Gold Coast Regiment, wounded some two years and a half before. Immediate suture of the divided musculo-spiral nerve was done, and extension and massage of the paralysed muscles carried out systematically. The extensors remained paralysed. The hand was useless. Tendon transplantation was carried out, and he left for West Africa, having rejoined his unit for duty.

The uselessness of the hand from dropped wrist is due to the inability to extend the hand and keep it extended to grasp an object, and to the

inability to extend the thumb and to abduct it from the fingers preliminary to grasping. If these two disabilities can be alleviated, a useful hand is obtained. A certain degree of finger extension by the lumbricales persists in every case of drop wrist, but unless the paralysed radial and ulnar wrist extensors, and the thumb extensors can be made good, no useful result can be expected.

To attain these objects the following transplantations have been carried out in cases of musculo-spiral paralysis:—

(*a*) The pronator radii teres, detached from its radial insertion, is transplanted into the long and short radial extensors.

(*b*) The flexor carpi radialis tendon, divided at the wrist, is brought round the radius, over the wrist extensors, and transplanted into the tendons of the extensores ossis metarcarpi, primi and secundi internodii pollicis, and the extensor indicis.

(*c*) The flexor carpi ulnaris tendon, divided at the wrist, is brought round the ulna, and transplanted into the tendons of the extensor carpi ulnaris and the extensors of the three inner fingers.

The details of these procedures, as we have carried them out at the base hospitals here, are well shown in the accompanying illustrations.

The operation we now undertake is as follows: The arm is laid on its ulnar side on a small table placed at right angles to the operating table. An incision through skin and deep fascia, three inches long, is made over the middle third of the radius. The supinator longus and the two radial extensor tendons are recognized and separated, the former being retracted forwards. The radius is now exposed, and the tendon of the pronator radii teres recognized by the direction of its fibres. The thick tendon is well separated from surrounding structures by blunt dissection, a large hernia needle passed round it, and it is cut away from its insertion into the middle of the outer surface of the radius. In cutting the insertion free, the knife must be kept close to the bone, so that the tendon is cleanly separated. The muscle is then raised slightly from its bed to ensure that it is free. The wrist is then fully extended and held in that position by an assistant, and the extensor tendons having been pulled upwards, the tendon of the pronator teres (which should have a tail-like end if properly separated from the radius) is applied to the extensor carpi radialis brevior. At the most convenient point an incision is made through the short extensor tendon, and the pronator tendon passed through it. The pronator tendon now lies between the short and the long extensors, and is stitched in position by several fine silk sutures, some of which embrace all three tendons. All bleeding is stopped, the wound stitched, a temporary dressing applied, and the rest of the operation continued. The arm is turned on to its posterior surface. An incision of about one inch is made through skin and fascia over the tendon of the flexor carpi radialis at the wrist. The tendon is freed, an aneurysm needle passed under it, and it is pulled forward. By pulling on the tendon at the wrist, it can easily be traced in

its course up the arm, and a second short incision is made over it about four inches above the former. The flexor carpi radialis tendon is again recognized and freed through the upper incision. An aneurysm needle is passed again round the tendon at the wrist, care is taken that the median nerve is not included, and the tendon is divided as near to its insertion as possible.

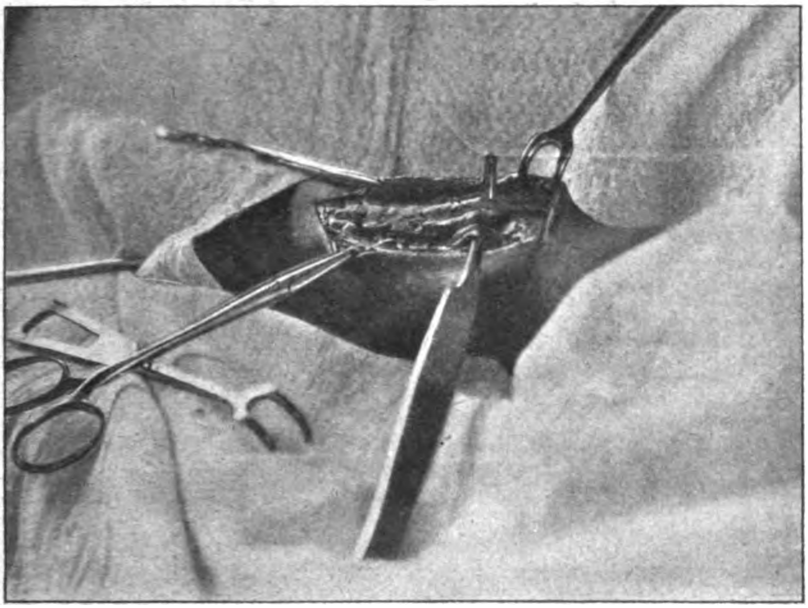

FIG. 1.—Tendon transplantation for drop-wrist on right side. The extensors of the thumb and index finger demonstrated through a longitudinal incision on the posterior surface and prepared for transplantation of the radial flexor tendon into them.

The arm is now turned on to its anterior surface, sterile swabs being placed over the two small incisions. An incision three or four inches long, is made from the wrist upwards, over the centre of the posterior surface of the forearm. Through this incision the tendons of the extensor ossis metacarpi pollicis, the extensor primi, the extensor secundi internodii pollicis and the extensor indicis are recognized. When sufficiently separated, a swab is placed over the wound, the arm is turned again on to its posterior surface, the tendon of the flexor radialis found in the upper wound and pulled out from its groove through the skin wound. From the wound on the posterior surface, a long thin pair of forceps is passed under the fascia and pushed out through the upper wound on the flexor surface. The flexor tendon is seized by its end and drawn through to the extensor surface in slanting fashion. Incisions are made in the four extensor tendons previously recognized and the tendon of the flexor carpi radialis is passed through them and stitched to each by very fine silk sutures.

The tendons of the extensor carpi ulnaris and the three inner extensors of the fingers are now recognized and freed. A swab is placed over the long wound on the extensor surface, and the arm once more turned with the flexor surface upwards. The flexor carpi ulnaris tendon is treated in the same way as the flexor carpi radialis; divided at the wrist, pulled out through a wound four inches above the wrist, and transferred to the extensor surface by being pulled under the fascia in slanting fashion round the ulna. The ulnar flexor tendon is then attached to the extensor carpi ulnaris and the extensors of the three inner fingers.

The five wounds are stitched, a dressing applied to them and to that over the pronator teres, and the hand is put up on a splint which maintains it in a position of extension.

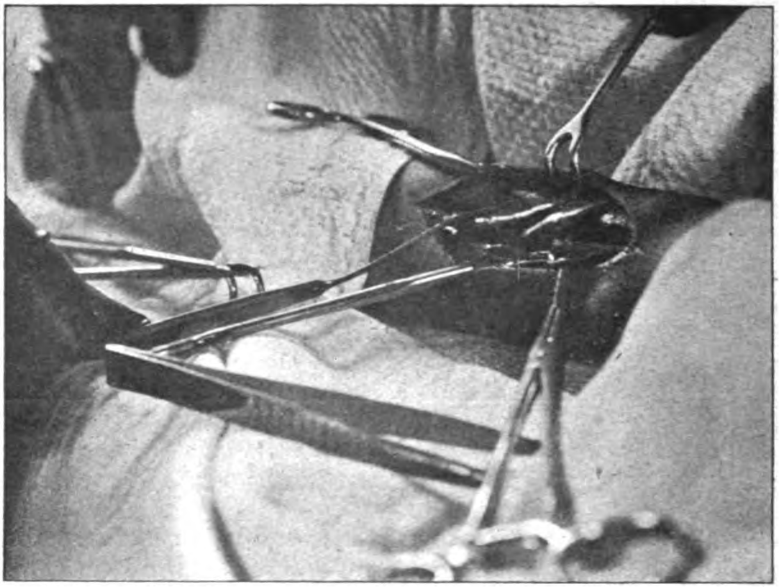

FIG. 2.—The flexor carpi radialis tendon brought round the right radius and through the thumb and index finger extensors. The tendon is stitched to the extensors and its redundant end seen in the grasp of the forceps, is cut away.

In our earlier cases we employed for this operation the skin incision described by Sir Robert Jones, of horse-shoe shape over the extensor tendons, "the convexity of the horse-shoe resting on the back of the carpus, with the two straight sides extending along the radial and ulnar borders of the forearm." A flap was turned back consisting of skin and fascia and all the tendons, both flexors and extensors, were recognized and dealt with through the space thus exposed. Our experience has been that considerable and persistent œdema of the hand resulted, no doubt due to cutting across all the superficial veins and lymphatics. Some patients,

too, complained of persistent numbness at the base of the thumb and radial side of the hand. Perhaps we made our flaps too big, but we have had none of the œdema and no anæsthesia since we adopted the single longitudinal incision over the extensor tendons, described above, and the subfascial method of dealing with the flexor tendons. I think, therefore, that this modification is worthy of record and recommendation.

We were somewhat disappointed at first that our cases did not regain any useful degree of voluntary wrist extension. The hand could be raised, and held, in straight line with the forearm, but not beyond that. I think this was due to not completely freeing the pronator teres before its transplantation into the radial extensors, and to not including the ulnar extensor in the group into which the ulnar flexor was transplanted. Since adopting these modifications in our technique, the results, as regards wrist extension have improved. The extensors of the wrist work at a mechanical disadvantage as regards power; it is essential, therefore, that as much available power as possible should be transferred to them. I consider it highly important that the hand should be held in extension during these transplantations, and that it should be maintained in extension for a fortnight or three weeks after operation. After that, training in the use of the hand should begin. It is wonderful how soon the movements of extension of the thumb and fingers are learnt.

For irreparable injury to the median nerve the tendon transplantations advocated by Sir Robert Jones were carried out in one case, viz., the transplantation of the paralysed outer two tendons of the flexor profundus digitorum into the two inner tendons of the same muscle, supplied by the ulnar nerve. The flexor carpi ulnaris was made to take on the work of the flexor sublimis digitorum by the transplantation of all four tendons of the latter muscle into the tendon of the former. Finally the tendon of the extensor carpi radialis longior, divided near its insertion, was brought round the radius and inserted into the tendon of the flexor longus pollicis. This patient was transferred too early to give a definite statement as to the result.

For division of the musculo-cutaneous nerve in the leg, with paralysis of the peronei we have carried out transplantation of the tendon of the peroneus longus into the outer side of the active tibialis anticus. The tibialis anticus thus becomes a bifid tendon pulling up the outer and inner sides of the foot at the same time.

The initial stages of this operation are the same as those for fixation of the peroneus longus to the tibia described below. The tendon is recognized and divided in the leg about six inches above the outer malleolus. It is again found on the outer side of the foot well in front of the malleolus. An incision about three inches in length is now made through skin and fascia in the anterior mid line of the leg about four inches above the ankle. The thick tendon of the tibialis anticus is isolated. The peroneus longus tendon is pulled out through the incision on the outer side of the foot and

transferred sub-fascially to the outer side of the tibialis anticus tendon, as shown in the illustration. The tibialis anticus tendon is tunnelled to receive the other, the foot is well extended, the peroneal tendon passed

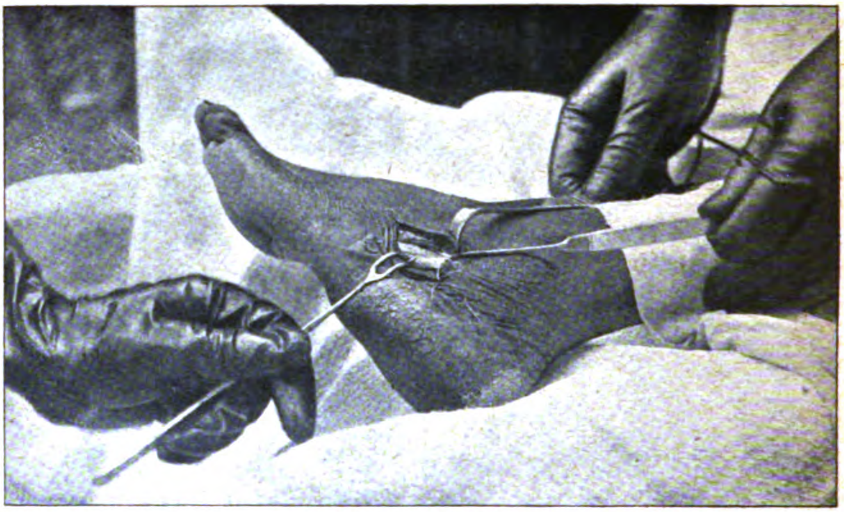

Fig. 3.—The preliminary step in the operation of fixation of the peroneus longus tendon to the left tibia, or the transplantation of that tendon into the tibialis anticus. The two peronei tendons are recognized below and in front of the external malleolus. The lower of the two is the peroneus longus.

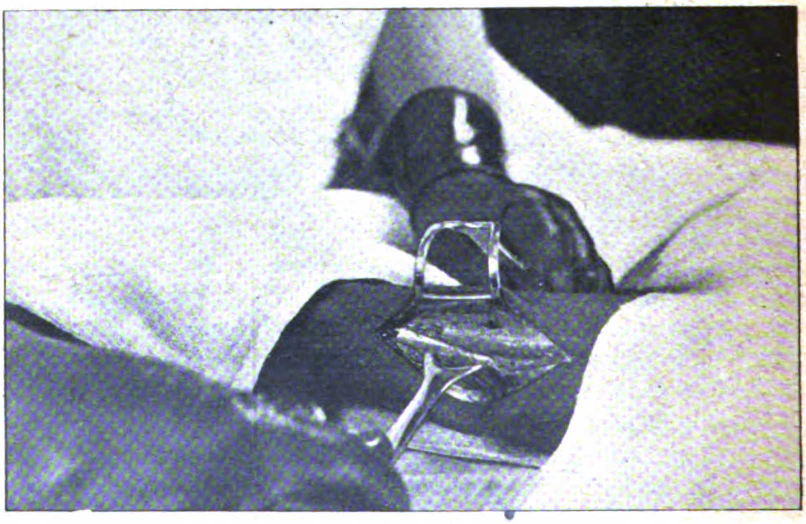

Fig. 4.—The tibia is exposed and tunnelled for reception of the peroneus longus.

through the tunnel, drawn taut and stitched in position. The results of this operation have been excellent, the patient being able to bring the sole squarely to the ground, instead of walking on the outer edge of the

foot. He has good power of extension at the ankle, though of course very little power of eversion. He can walk and run as well as ever, and will return as a useful soldier to the ranks.

The operation usually recommended for paralysis due to cutting of the musculo-cutaneus nerve in the leg is the transplantation of the insertion of the tibialis anticus from the inner to the outer side of the foot. I venture to recommend the modified operation I have described above as an improvement. I am not aware that it has been described or suggested before, and our experience is that by it the inversion of the foot is cured and the balance of the foot restored, without the disadvantage of weakening the inner arch of the foot by separation of the anterior tibial tendon from its normal insertion.

Tendon Fixation.—This operation has been performed many times in this Force, for various conditions, but it has been chiefly used for irreparable injury to the external popliteal nerve with consequent drop foot.

The technique we have employed has been that described by Sir Robert Jones, with trifling modifications. The stages of the operation are well shown in the photographs.

The details are as follows: The two peroneal tendons are isolated and recognized through a short incision below and in front of the external malleolus. The lower tendon is that of the peroneus longus. The peroneus longus tendon is again found and isolated through an incision about six inches above and slightly behind the external malleolus. The tendon is brought out through this upper incision and divided.

An incision three inches long is now made, four inches above the ankle along the anterior border of the tibia. The periosteum is divided within the limits of the incision and reflected from the internal and external surfaces of the bone. The tibialis anticus muscle and tendon is retracted to the inner side. With a burr a hole is drilled through the tibia large enough to admit the peroneal tendon.

A small incision is now made through skin and fascia just above the anterior annular ligament and just external to the tendon of the tibialis anticus.

We now turn again to the small incision on the external side of the foot. A broad hernia needle is passed round the long peroneal tendon and it is pulled down out of its groove completely outside the wound. From the small incision in front of the ankle a long pair of forceps is passed under the fascia and annular ligament to emerge at this small wound on the external side of the foot. The end of the tendon is grasped and drawn through. From the incision over the tibia the forceps is again pushed down under the fascia to emerge at the wound in front of the ankle. The end of the tendon is again grasped and drawn up into the wound over the tibia. The tendon is now passed through the hole in the tibia, the foot is pushed into an extended position, and the loop of the peroneus longus

drawn taut, and stitched firmly to itself and to the periosteum. The tibialis anticus tendon is divided, drawn firmly upwards and stitched over the loop and the upper end brought down and stitched over all.

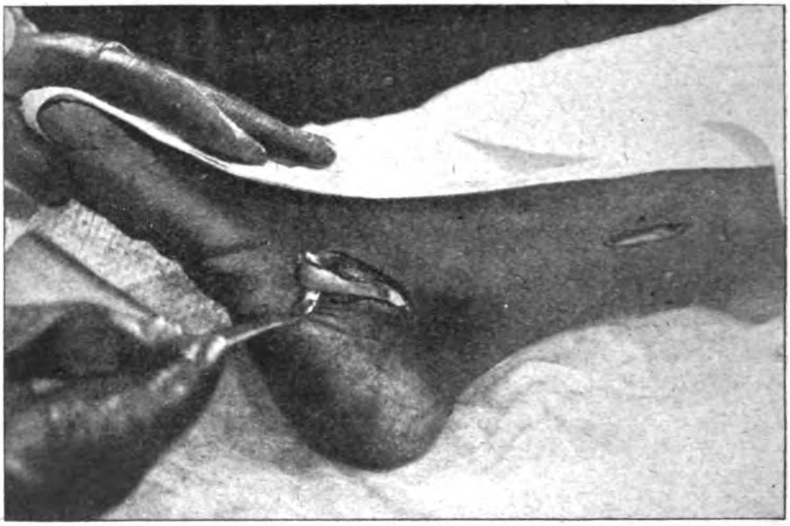

Fig. 5.—The long peroneal tendon is recognized and divided through an incision about six inches above the outer ankle, a hook passed round it at the ankle and traction applied.

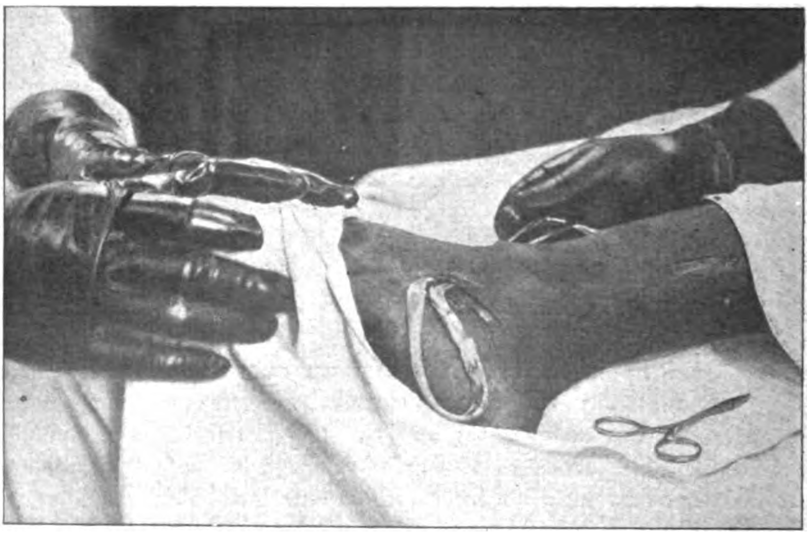

Fig. 6.—The peroneal tendon is drawn completely out through the wound below the external malleolus. A sinus forceps is passed under the fascia from above the anterior annular ligament. The end of the tendon is grasped and completely drawn through.

We find the slight modification of making a loop of the peroneus tendon an improvement on merely stitching it to the periosteum, or fixing it with a tack. By the loop method it can be drawn taut, and the resulting

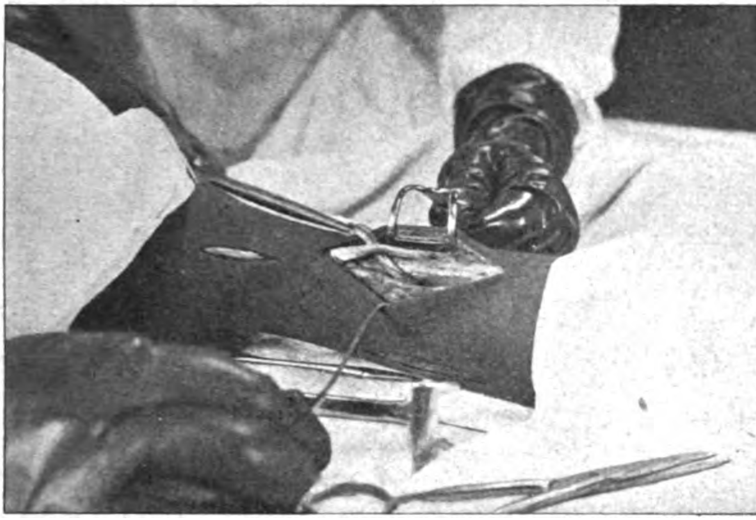

Fig. 7.—The sinus forceps is again passed down from the wound over the tibia, and the peroneus longus tendon drawn up and passed through the tunnel in the tibia. In the figure it is held ready to be fixed by stitching to itself and the periosteum.

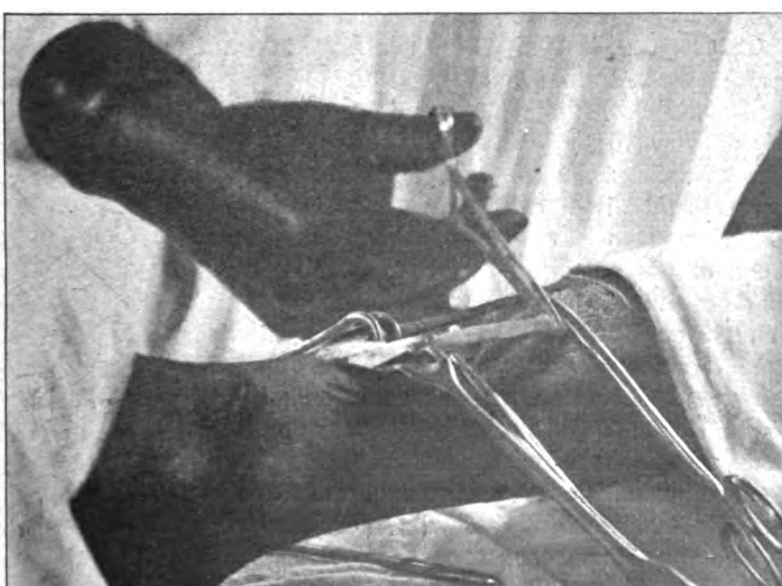

Fig. 8.—In paralysis of the peronei only, the peroneus longus tendon is transplanted into the unparalysed tibialis anticus. In the figure the peroneus longus tendon of the right side is passed through the anterior tibial tendon ready for stitching, after which the redundant piece seen in the forceps is cut away.

anterior ligament is more likely to support the foot in the required position. It is, perhaps, worthy of note that we have found it advisable to make all the preparations for the reception of a tendon to be transplanted or fixed *before* that tendon is pulled out of its groove into the air. If left in its normal groove till the last moment it will not be injured during the preparation of its new position, and is less likely to form adhesions to surrounding structures along its new groove.

For irreparable complete division of the trunk of the sciatic nerve a series of operations have resulted in giving a dependable limb. The ankle is usually found to be fixed in a position of equinus, and the paralysed ham-strings contract, fixing the knee joint in semi-flexion. For such a case the following operations were carried out: (*a*) Lengthening of the tendo-achilles; (*b*) fixation of the peroneus longus and tibialis anticus as described above; (*c*) tenotomy of the ham-strings, and finally; (*d*) resection of the knee-joint to produce a stiff joint. The case I have in mind, a carrier, was many months in the jungle before he was found and passed through various field units to the base. It was then a matter for consultation as to whether amputation was not the only course remaining. I decided against it, and he has now a natural peg leg, which he will soon learn to use for carrying himself and perhaps a light load. I hardly think he would do so well on an artificial peg-leg, even if he could have got one, and of course a fixation apparatus for the knee-joint or ankle-joint was out of the question.

In paralysis due to injury of the ulnar nerve an attempt to unite the divided ends has been made in each case in the base hospitals here. This was done in view of the grave crippling produced by this injury, due to paralysis of the intrinsic muscles of the hand. No tendon transplantation will modify this, and the only hope is successful nerve suture. Luckily the ulnar nerve lends itself to such treatment very readily. It is easily accessible along its whole course, and by flexion of the wrist, straightening the elbow, or even altering the course of the nerve from behind to the front of the elbow, gaps of 1½ to 2 inches may be overcome and the nerve ends brought together. During the past six months I have carried out several secondary nerve sutures for the ulnar nerve, using subcutaneous fat to surround the ends after union and to prevent their adhesion to surrounding tissues. It is too early yet to report on the results of these operations, but I have hopes that they will all do well, as in each case I can trace the nerve in its new course, and there is no loss of continuity. In one case of an accident resulting in division of both ulnar and median nerves, primary suture was successfully carried out, and within a month the patient was able to tell which finger was lightly touched, with his eyes shut. He had no return of muscular power, but the abnormally rapid return of sensation justifies a hope that muscular power will be quickly restored.

I wish gratefully to acknowledge the untiring assistance I have received

from the officers working in the surgical divisions of the base hospitals in this force. Captain J. J. Liston, I.M.S., and Captain Tudor-Thomas, R.A.M.C., of the 3rd African Stationary Hospital, Captains A. H. Bone and W. Hogarth Kerr, R.A.M.C., of the Carrier Hospital, Captain Steele R.A.M.C., of the Prisoners of War Hospital, and Captain J. B. Hume, R.A.M.C., 84th General Hospital, all carried out many of the operations described above. To Captain Ryan. R.A.M.C., 84th General Hospital, also, my thanks are due for the care and trouble he took in producing the photographs appended.

To Major-General Sir Robert Jones we are all indebted for the inspiration to attempt alleviation of these crippled limbs, and such success as we have attained is attributable to his work.

INFECTION.

PATHS OF SPREAD OF BACTERIAL EXOTOXINS.[1]

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SUMMARY.

SECTION I.—MODE OF SPREAD OF TETANUS TOXIN.

A.—Subcutaneous Inoculation.

B.—Intravenous Inoculation.
- (1) Passage into the Tissues.
- (2) Passage into the Cerebrospinal Fluid.
- (3) Passage into the Central Nervous System.

C.—Neural Spread.
Axis Cylinders *v.* Neural Lymphatics.
- (1) Lymphatic Spread of Washed Spores.
- (2) Blocking of Lymphatic Channels.
- (3) Channels of Ascent of Colloidal Dyes.
- (4) Effect of Section of Ventral Nerve Roots.

D.—Action of Iodine on Tetanus Toxin.

E.—Site of Action of Tetanus Antitoxin.
- (*a*) Passage to Central Nervous System by Blood-stream.
- (*b*) Passage from Cerebrospinal Fluid.
- (*c*) Passage along Nerves.

THIS paper is a continuation of a study on bacterial invasion and infection, the first part of which was published in the *Proceedings of the Royal Society of Medicine*.

In this paper we have studied the paths of spread of the exotoxins, especially tetanus toxin, and in view of the importance of the subject, the site of action of tetanus antitoxin. At first sight it may appear to have been superfluous and even unwarranted to undertake the study in view of the work of Ransome and Meyer [2], published in the *Archiv f. experimentelle Pathologie und Pharmacologie*, vol. xlix, pp. 369 *et seq.*, 1903.

These observers state that their experiments lead them to conclude that the tetanus toxin reached the central nervous system solely by way of the axis cylinders of the motor nerves to the anterior cornual cells, and that if it ascends by the sensory nerves towards the cord the posterior root ganglion acts as a block to further spread since tetanus dolorosus only develops when the poison is experimentally inoculated into the posterior root between the ganglion and the cord. They came to the conclusion

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[1] Reprinted from the *Journal of Pathology and Bacteriology*, vol. xxiii, No. 1.

that the toxin did not spread to the cord by way of the perineural lymphatic sheaths.

Orr and Rows [3] showed that if bacteria were left in contact with a nerve trunk they could be demonstrated in the spinal cord, having travelled along the perineural lymphatic sheath along the posterior root ganglion and along the spinal ganglia to the cord.

Golla [4], who carried out some experiments for the Tetanus Committee of the War Office, was also inclined to believe in some degree in the perineural spread.

Marie and Morax [5] concluded that the toxin only ascended by way of the axis cylinders. They found that after section of a nerve tetanus toxin could still be absorbed by the peripheral end, but much more slowly, and this occurred even two days after the section had been performed. Later it did not occur, this coinciding with the occurrence of degeneration of the axis cylinder.

Before entering into these points it is necessary first to record our experiments with regard to the distribution of tetanus toxin after subcutaneous and intravenous inoculation.

A.—Subcutaneous Inoculation.

Experiment 1.—Rabbit of 1,859 grammes received 20 millions per gramme of tetanus toxin subcutaneously into the right hind leg. The animal was killed after eight hours, thoroughly washed with normal saline, emulsions were made of its tissues, and 0·1 gramme of each tissue was inoculated into mice. The cord was cut into segments corresponding to the lumbar nerve roots, and each piece, ground up in a small quantity of saline, used for inoculation. The sciatic nerves were divided at the level of the knee into upper and lower fragments. The rabbit was also bled from the ear at intervals to ascertain the rate of appearance of the toxin in the blood.

1 c.c. serum 2½ hours after inoculation	*Nil*
1 c.c. ,, 6½ ,, ,, ...	*Nil*
1 c.c. ,, 8 ,, ,, ...	Died of tetanus in 5 days, local symptoms after 4 days
Lower end right sciatic (side inoculated)	Died in 48 hours
Upper end ,, ,, ...	*Nil*
Left sciatic	*Nil*
Segments of cord	*Nil*
Right popliteal gland	Death in 40 hours
Spleen	Symptoms in 7 days, died 8th day, typical symptoms
Liver	*Nil*
Marrow	*Nil*
Lung	*Nil*
Chyle (0·5 c.c.)	Death in 3 days
Urine	*Nil*

Thus the toxin was present in the blood serum in eight hours in quantity sufficient for one cubic centimetre to contain a minimal lethal

dose for a mouse. The toxin had not travelled far up the sciatic nerve but had got through the lymphatic glands to the chyle and blood-stream.

Experiment 2.—(Like experiment 1). Rabbit 2,000 grammes 20 millions per gramme inoculated into the right leg. Animal killed twelve hours after inoculation. Inoculations into mice as before.

Serum 1 c.c.	Death in 36 hours
Œdema fluid from seat of inoculation	,, 12 ,,
Popliteal gland	,, 21 ,,
Pelvic gland	,, 24 ,,
Lumbar gland	,, 24 ,,
Chyle 1 c.c.	,, 22 ,,
Lower end of right sciatic nerve	,, 24 ,,
Upper end	,, 34 ,,
Sciatic nerve, left	*Nil*
Spleen	(Died septic)
Marrow	Death in 96 hours
Liver	Symptoms local tetanus 6th day
Brain	*Nil*

Here several lethal doses were present in the quantities of serum, chyle, nerve, etc., used, but very little in the other viscera.

Experiment 3.—Rabbit of 2,000 grammes. Same dose as Experiment 2, also inoculated into right leg; kept alive for twenty-five hours. Symptoms of tetanus.

1 c.c. serum	Symptoms after 96 hours
1 c.c. chyle	,, ,, 48 ,,
Cerebrospinal fluid	*Nil*
Seat of inoculation	Died in 72 hours
Popliteal gland	,, immediately (accident)
Pelvic gland	,, in 24 hours
Lumbar gland	,, ,, ,,
Spleen	,, ,, ,,
Liver	*Nil?*
Marrow	24 hours
Lower right sciatic	Died in 24 hours
Upper right sciatic	,, 36 ,,
Left sciatic (upper)	,, 48 ,,
,, ,, (lower)	*Nil*
Cord segments	*Nil*
Medulla	*Nil*
Brain	*Nil*

Here are results as in Experiment 2, only there is a greater accumulation of toxin in the spleen, marrow and nerve of side inoculated, and in addition there is toxin in the opposite sciatic nerve. Further, these results prove that the presence of the toxin in the tissues like the spleen, marrow, etc., in this experiment is not due to insufficient washing out, since 0·1 gramme of the tissues killed in twenty-four hours, whereas the serum in doses of 1 cubic centimetre only produced symptoms in ninety-six hours, hence the result of the tissue inoculations cannot be due to retained blood. The same can be seen in the next experiment.

Experiment 4.—Same as previous experiment. Inoculation into right leg. Animal alive for forty-eight hours, marked symptoms of tetanus.

1 c.c. serum	*Nil*
Seat of inoculation	Died 7th day
Popliteal gland	„ 5th „
Pelvic gland	„ 4th „
Lumbar gland	„ 4th „
Chyle (0·5 c.c.)	*Nil*
Spleen	Died 96 hours
Liver	*Nil*
Marrow	*Nil*
Lower right sciatic nerve	Died in 48 hours
Upper „ „	„ 48 „
Brachial plexus	*Nil*
Cord segments	*Nil*

In forty-eight hours, the serum in quantities of one cubic centimetre no longer contained enough toxin to give rise to even local tetanus. The lymphatic glands also had very little. The same was the case with the spleen. The other viscera apparently contained no toxin. There was, however, a small amount of toxin in the opposite sciatic nerve.

Experiment 5.—A cat was anæsthetized with ether, inoculated with ten cubic centimetres of tetanus toxin subcutaneously into the right leg. The thoracic duct was exposed and the chyle collected.

	Result
1st quarter of an hour; inoculated into mouse	*Nil*
2nd „ „ „ „	*Nil*
3rd „ „ „ „	Typical local tetanus in 50 hours; death 96 hours

The animal was killed. Post mortem there was no apparent damage to vessels, capillaries, etc., at the seat of inoculation. This experiment shows that the toxin passes rapidly through the lymphatics to the blood-stream.

These experiments thus confirm those of Roux and Marie [5], and Meyer and Ransome [2].

(i) That tetanus toxin is present in the nerve of the side injected. The toxin may, however, not only be present in the axis cylinders but also in the peri- and epi-neural lymphatic sheaths. It seems probable to us that it is only the toxin in the latter position that can be demonstrated by inoculation into mice, since it is possible that just as the tissues of the central nervous system render the toxin inert, as shown by test on a mouse, so the axis cylinders and medullary sheaths of a peripheral nerve may do the same for any toxin ascending in them.

(ii) Although the toxin is present in the central nervous system as evidenced by the symptoms, it cannot be demonstrated when the tissue is inoculated into a mouse.

In addition they show that the toxin inoculated into the subcutaneous tissues spreads along the lymphatics to the glands, thence to the thoracic

duct into the circulation and is taken up to some small extent by the marrow, spleen, liver, etc., just as is the case with bacteria, and as will be shown later for diphtheria toxin.

This is in opposition to the results of Bruschettini [6], quoted by Meyer and Ransome.

The experiments also bring out the spread of the toxin down the nerve of the opposite limb. This cannot be explained at all easily if the toxin is believed to spread solely along axis cylinders, but if it also spreads along the neural lymphatics to the lymphatic spaces of the cord and thence to the opposite nerve lymphatic spaces the path is obvious.

B.—Intravenous Inoculation.

(1) *Rate of Appearance of the Toxin in the Chyle.*

Experiment 7.—A large cat was fed on milk to get a good flow of fatty chyle. It was then inoculated intravenously with 30 millions per gramme of tetanus toxin. The thoracic duct was exposed and the chyle collected and injected into mice.

$\frac{1}{4}$ c.c. collected in 1st	5 minutes	*Nil*
$\frac{1}{2}$ c.c. ,, ,,	5-10 ,, ...	Died in 72 hours
$\frac{1}{4}$ c.c. ,, ,,	10-15 ,, ...	,, 40 ,,
$\frac{1}{4}$ c.c. ,, ,,	15-25 ,, ...	,, 22 ,,
$\frac{4}{5}$ c.c. ,, ,,	25-30 ,, ...	,, 18 ,,
$\frac{1}{5}$ c.c. ,, ,,	30-40 ,, ...	,, 18 ,,
$\frac{2}{5}$ c.c. ,, ,,	40-50 ,, ...	,, 18 ,,
$\frac{1}{2}$ c.c. ,, ,,	45-60 ,, ...	,, 18 ,,
$\frac{1}{4}$ c.c. ,,	2 hours after	,, 18 ,,
2 c.c. serum	,, ,, ...	Local tetanus in 4th day. The mouse was killed on 6th day; no generalization.

This shows that the tetanus toxin has such a small molecule that it rapidly passes from the capillaries into the connective tissue spaces and thence into the thoracic duct. The chyle secreted during the second five minutes contained several lethal doses for a mouse. A foreign serum inoculated intravenously cannot be detected in the chyle even after several hours, as will be seen from the following experiments :—

Experiment 8.—A cat was anæsthetized and inoculated intravenously with twenty cubic centimetres of horse serum, the thoracic duct was opened and the chyle collected for three hours, and then inoculated subcutaneously into guinea-pigs.

(1) Chyle of 1st hour
(2) ,, ,, 2nd ,,
(3) ,, ,, 3rd ,,

After three weeks the animals were tested for hypersensitiveness against horse serum with negative results.

Experiment 9.—Some horse serum was iodized and was tested to be certain that there was no free iodine; ten cubic centimetres were then

inoculated intravenously into a cat under anæsthesia. The thoracic duct was opened and the chyle collected for three hours.

The chyle was then treated with acid to liberate any iodine, and then tested. The result was negative.

This experiment (7) further shows how rapidly the removal of the toxin from the blood takes place. Because, however, of the continual passage back into the blood under normal conditions, the toxin can be demonstrated for thirty-six to forty-eight hours in the circulation.

(2) *After Intravenous Inoculation the Toxin cannot be demonstrated in the Cerebrospinal Fluid.*

Experiment 10.—A cat was anæsthetized, the left jugular vein was exposed, and twenty cubic centimetres of tetanus toxin were inoculated into it. The cerebrospinal fluid from the subarachnoid space was collected for two hours. The animal was finally inverted to obtain all the fluid possible from the spinal canal. The fluid was injected into mice.

1 c.c. collected in 1st 30 minutes	*Nil*
1 c.c. ,, ,, 2nd 30 ,, ...	*Nil*
1½ c.c. ,, ,, 2nd 60 ,, ...	*Nil*

The animal was killed, the choroid plexus removed, ground up, and injected into a mouse, without result.

One cubic centimetre of the cat's serum killed a mouse in eighteen hours. In another experiment the vessels were damaged, and so the fluid was blood-stained, with the result that toxin got into it.

Specimens of cerebrospinal fluid obtained by one of us from cases of tetanus also produced no results in mice, even after concentration in vacuo.

These experiments prove that the tetanus toxin is not allowed to pass into the cerebrospinal fluid.

(3) *The Question then arises if Tetanus Toxin can pass directly from the Capillaries into the Tissues of the Central Nervous System.*

We have already mentioned that tetanus toxin which had gained access to brain tissue cannot be demonstrated by subcutaneous inoculation of the tissue into a mouse. Metchnikoff [7] has, however, drawn attention to the fact that in the guinea-pig subcutaneous inoculation of tetanus toxin exposed to brain tissue in vitro was followed by tetanus. His explanation was that, owing to the slowness of the phagocytosis of the brain—toxin emulsion in the subcutaneous tissues of the guinea-pig—the toxin became liberated from its combination and was able to produce symptoms.

Experiment 11.—A rabbit was inoculated with 20 cubic centimetres of tetanus toxin intravenously. The animal was kept alive for twenty-four hours, when it had marked symptoms of cephalic tetanus. It was then killed, and washed out with normal saline. The brain and cord were then ground up, and inoculated subcutaneously into two guinea-pigs, without

result. Thus the direct demonstration, by inoculation, of the presence of tetanus toxin in the central nervous system failed.

If the toxin could gain direct access to the central nervous system from the capillaries, the symptoms of cerebral tetanus, just like those produced experimentally by direct intracerebral inoculation, should be expected to occur. These symptoms, however, never occur. Intravenous inoculation is followed by the symptoms of cephalic tetanus, due to the spread of the toxin along the cephalic nerves, the centres linked up with the periphery by the shortest nerve paths showing symptoms first.

These observations show that the capillaries of the central nervous system and choroid plexus have a selective, and thus a protective action, and do not allow tetanus toxin to pass through them, as do the tissue capillaries. The same result occurs if an iron salt, such as potassium ferrocyanide, be inoculated intravenously.

In such an experiment the iron salt can be demonstrated in the chyle in the first five minutes after the intravenous inoculation in the connective tissues, organs, etc., and is rapidly eliminated by the kidneys. The central nervous system shows no increase in iron, even by the most delicate method of demonstrating the iron by means of the hydrazine sulphate and dimethyl glyoxine test (shows 1 : 100,000,000). The choroid plexus, however, gives a very marked iron reaction.

When an iron salt like potassium ferrocyanic is inoculated into the subcutaneous tissue, its presence can be demonstrated in the nerve supplying the seat of inoculation up to the corresponding segment of the cord, and even in the opposite nerve.

Experiment 12.—This experiment was performed by inoculating five cubic centimetres of a ten per cent. solution of potassium ferrocyanide into the right-hand paw of a rabbit, and leaving it for twenty-four hours. The animal was then killed, bled, washed out with iron-free normal saline, the sciatic nerves and cord divided up in the usual way, the organic material destroyed, and the test for iron performed with the method given above, the results being compared with the same tissues from a normal animal. Depth of pink indicated by + + +, + +, +, — (— = practically colourless).

Animal experiments on		Control
Seat of inoculation	— ..	—
Popliteal gland	— ..	+ (hæmorrhage)
Lumbar gland	+ ..	—
Serum	— ..	—
Lower right sciatic	+ ..	—
Upper ,, ,, ...	+++ ..	—
Left sciatic (upper)	++ ..	—
,, ,, (lower)	— ..	—
Lower lumbar cord and plexus	+++ ..	—
Upper ,, ,, ,,	+ ..	—
Dorsal ,, ,, ,,	— ..	—
Brain ,, ,, ,,	++ ..	+

These experiments show that the tissues behave in the same way to an iron salt as they do to tetanus toxin.

C.—Neural Lymphatic Channels.

We now propose to discuss the question of the spread along the neural lymphatic channels.

In the first section (A) we confirmed the observations of Meyer and Ransome [2] that the toxin was present in the nerve trunks but could not state definitely that it was only in the axis cylinders.

Some of our experiments were suggested by the results obtained by Orr and Rows [3] who found that bacteria left in contact with a nerve trunk ascended by the neural lymphatics to the cord and could be found spreading along the posterior nerve roots through the spinal ganglia to the cord.

(1) *Experiments using Washed Spores for Injection into the Nerve Trunk.*

In these experiments we made use of an observation made by us that when washed spores are inoculated into an animal the spores do not remain quiescent, but that a certain number develop into vegetative forms, remain in-phagocyted for a long time, only becoming gradually destroyed by phagocytosis in the tissues, and do not appear to multiply. We accordingly took some cultures of *Bacillus anthracis* which had well spored and heated a saline emulsion of the cultures at 80° C. for three hours. These washed spores germinated when sown on nutrient media and on inoculation into a guinea-pig the cultures thus obtained were typically pathogenic. Some of the washed spores inoculated directly into the peritoneal cavity followed next day by a small subcutaneous dose of lactic acid proved fatal, whereas the washed spores by themselves in similar or even larger doses, in spite of germination, did not produce disease.

Experiment 13.—0·25 cubic centimetre of a very thick emulsion of spores so treated was inoculated into the upper part of the sciatic nerve of a series of rabbits, at a level just below the great trochanter. These animals, which never developed any symptoms of infection, were killed at intervals. In all, there was some inflammatory reaction around the seat of inoculation, but the nerve roots, meninges and cord showed no thickening or inflammatory reaction, and nowhere in the cord was there a leucocyte infiltration or glial proliferation. In specimens from a rabbit killed forty-eight hours after the injection, the vegetative forms of *B. anthracis* were seen in both the motor and sensory parts of the nerve, spreading in the case of the afferent nerve to the posterior root, through the spinal ganglion to the cord. The bacteria in their vegetative state were lying around the nerve fibres. Similarly they spread along the afferent part of the nerve to the anterior root to the cord, and in each case extended well into the white matter but not into the grey.

These experiments thus confirm those of Orr and Rows [3]. They also suggest that if bacteria can spread along the neural lymphatic sheaths of both the efferent and afferent parts of the nerve trunk, and in the case of the latter through the spinal ganglion, and thus reach the cord, there is a strong *a priori* ground for inferring that tetanus toxin with its small molecule might do the same, in addition perhaps to ascending directly to the anterior cornual cell by the axis cylinder of the efferent nerve. This ascent along the neural lymphatic spaces to the lymphatic spaces of the cord also seems to be the most probable explanation of the route of spread of tetanus toxin along the cord and the sequence of muscular involvement.

In by far the greater number of rabbits experimented upon, the march of symptoms was homolaterally upwards from the injected limb cephalically and it appears to us this can only be explained by cord lymphatic spread. In a few cases the opposite corresponding limb became infected next before the homolateral anterior when the injection was made into the hind limb.

Later of course during an infection or from a large amount of toxin experimentally inoculated, the toxin which has got into the general circulation will ascend to the cord, etc., by the other nerves. Then the cephalic and trunk symptoms occur quickly, the toxin travelling along the shortest nerve trunks reaching the corresponding parts of the central nervous system quickest. But at the seat of infection or inoculation where the concentration of the toxin is greatest, more is available to ascend the local neural route to the cord than elsewhere, and so the spread locally from this to the neighbouring parts of the cord will take place more rapidly. The symptoms from this will be also more intense than those occurring in the other parts from the greatly radiated toxin ascending to them. If we believe that the spread is along axis cylinders only, it is impossible in our present state of knowledge of the central nervous system to explain the homolateral spread.

(2) In the next series of experiments the perineural lymphatic sheath was blocked in various ways to study any possible alterations in the onset of the symptoms produced by subcutaneous or intraneural inoculation of the toxin distally to the block.

Experiment 14.—A rabbit was anæsthetized with ether. The left sciatic was exposed with aseptic precautions midway between the popliteal space and the exit of the nerve from the spinal canal. Tincture of iodine was inoculated thoroughly into the nerve bundles. The wound was stitched up. The animal recovered and showed absolutely no sign of paralysis.

After seven days five cubic centimetres of tetanus toxin were inoculated into each hind leg. On the side which had not been treated with iodine tetanus developed in twenty-eight hours; on the side which had been treated with iodine the symptoms of local tetanus only developed after fifty hours and were complete in seventy-two hours, the animal was then killed.

Experiment 15.—The same operation was performed on the right sciatic nerve of a rabbit with the same precautions, under ether. Four days afterwards 2·5 cubic centimetres of tetanus toxin were inoculated into the

tissues of the hind leg on the operated side; 2·5 cubic centimetres of toxin were similarly inoculated into the hind leg of a normal control rabbit. The normal rabbit showed marked tetanus of the inoculated leg in thirty-six hours, and later the symptoms spread on the homolateral side to the fore limb in forty-eight hours.

In the iodine treated rabbit, symptoms of tetanus, slight stiffness of the leg, occurred in seventy-two hours and the rigidity was complete in ninety-six hours, but there was no spread. The animal was kept alive for seven days.

Experiment 16.—Experiment on a rabbit under ether, aseptic precautions. The right sciatic nerve was injected with tincture of iodine as before and three days later five cubic centimetres of tetanus toxin were inoculated into each leg. In twenty-four hours the left leg was perfectly rigid, the right quite normal, in forty-eight hours the right also became affected.

These experiments show that the ascent of the tetanus toxin can be delayed by injecting iodine into the tissues of the nerve. This may presumably be supposed to act chiefly by causing inflammation and occlusion of the neural lymphatics but may also cause some damage in the axis cylinders and so delay the ascent of the toxin up the axis cylinders. The damage, however, can only be slight as there was no appreciable physiological damage of function in these animals, not the least apparent sign of weakness in the limb operated on.

Experiment 17.—A rabbit was anæsthetized, the right sciatic nerve exposed in the middle of the thigh and ¼ cubic centimetre of egg albumen was injected into the nerve bundles. Then 2·5 cubic centimetres of tetanus toxin were inoculated into the subcutaneous tissues of the hind paw of the same side.

A control rabbit of the same weight was also given 2·5 cubic centimetres of the toxin, into the right hind paw. This latter rabbit had typical local symptoms in twenty-four hours, and complete rigidity of the whole extremity in thirty hours. The former rabbit showed no signs for twenty-four hours and then some stiffness of the leg developed which lasted for three days and then passed off.

Experiment 18.—A rabbit was anæsthetized with ether and the sciatic nerves were exposed. Into the right sciatic was inoculated some horse serum, into the opposite some normal rabbit serum. Then into each hind paw were inoculated 2·5 cubic centimetres of tetanus toxin. Typical tetanus developed on the left side in twenty-four hours. On the opposite side nothing occurred till seventy-two hours and the limb was completely rigid in ninety-six hours.

Experiment 19.—A rabbit was anæsthetized with ether; both sciatic nerves exposed in the space between the great trochanter and the exit from the great sciatic notch.

Into the right nerve was inoculated ¼ cubic centimetre of egg

albumen, into the other ½ cubic centimetre of normal saline. Then into each sciatic nerve at a level just above the popliteal space ½ cubic centimetre of tetanus toxin was inoculated. The wounds were treated aseptically and sewn up. There was no weakness in either limb.

In twenty-four hours the left leg had developed typical tetanus paralysis, the right was quite normal and continued so for three days when the animal was killed.

These experiments show:—

(1) That inflammatory occlusion of the neural lymphatic sheath greatly delays the onset and diminishes the severity of the symptoms of tetanus, due to the local inoculation of tetanus toxin. This might be supposed to be due to the action of the iodine on the toxin, but the interval allowed after the inoculation of the iodine we think precludes this supposition. The question of damage to the axis cylinders has been discussed.

(2) That blocking the lymphatic channel by a viscid colloid like egg albumen or normal horse serum does the same. Here inflammatory reaction in the axis cylinders cannot account for this delay since normal rabbit serum, from another animal, similarly injected did not afford protection and presumably the mechanical inflammatory reaction of the operation, etc., would be the same as with horse serum or egg albumen.

The neural lymphatic path thus appears to play some part in the spread upwards of the toxin, unless it is believed that in these experiments the inflammatory reaction around the seat of inoculation influenced the flow up the axis cylinders, but no physiological defect of motor control was apparent.

The question then arises, Why does the subcutaneous inoculation of tetanus toxin not produce tetanus dolorosus as well as motor tetanus?

Is it that the posterior root ganglion acts as a toxin filter, as suggested by Homen [8] for bacteria, and keeps back the toxin from the posterior root zone and destroys it. Or is it that in the experimental production of tetanus dolorosus the cord gets damaged slightly in some way and that this is necessary for its production and that tetanus toxin reaching the unimpaired posterior root zones, etc., has no effect on the sensory channels, for one must conclude that if bacteria can reach the posterior root the bacterial trap of the posterior root ganglion must be only capable of acting to a limited degree. It might be argued that the spread is due to the bacteria, which have been caught in the ganglion, being sufficiently virulent to multiply and so break down the defence. At first sight this might appear to be the explanation, because if colloidal dyes like trypan blue be inoculated into a nerve trunk the posterior root ganglion acts as a block to the further passage of the pigment whilst its spread along the ventral root to the surface of the cord (*vide infra*) is unhindered.

But in the case of our experiments with washed spores of *B. anthracis*, the element of multiplication of the bacteria does not arise, because we have found experimentally that the vegetative forms of the bacteria which

develop from the washed spores do not undergo multiplication, but gradually die off. Hence we must conclude that if large non-motile bacteria can pass through the posterior root ganglion and reach the cord, it is highly probable that tetanus toxin might be able to do the same. Then how is it that tetanus dolorosus does not occur?

It may be.—

(1) That the main lymphatic channels are along the anterior roots, and little gets to the posterior root ganglion, and is dealt with there.

(2) That to produce tetanus dolorosus a lesion of the cord is necessary.

(3) *Injection of Colloidal Pigment into the Nerve Trunk.*

Experiment 20.—A rabbit was anæsthetized with ether, the left sciatic nerve exposed, and 0·2 cubic centimetre of a thick suspension of trypan blue in normal saline was inoculated into the nerve soon after its exit from the great sciatic foramen.

After twenty-four hours the rabbit was killed, and it was seen that the dye had extended along the peri- and epi-neural lymphatic sheaths as far as the posterior root ganglion; here the pigment ceased abruptly, and the ganglion showed no pigmentation.

Along the ventral root the pigment could be traced with decreasing intensity, and, finally, it appeared to diffuse itself faintly over the surface of the cord at the entry of the nerve root.

There was no pigment in the cerebrospinal fluid. Some of the pigment travelled along a branch of lymphatic to the large gland at the sacral promontory. Other experiments gave similar results.

Experiment 21.—Same as above, except that the pigment was inoculated into the nerve in the mid-thigh region. The animal was kept alive for twelve hours. In this case not only did the pigment travel along the peri- and epi-neural lymphatic sheaths, as in the previous experiment, but the axis cylinders were pigmented right up to the intervertebral foramina, the pigmentation being less deep there than lower down. The pigmentation of the axis cylinders was much more intense than that of the neural lymphatic sheaths and sections showed the staining microscopically.

We obtained a similar result in experiments quoted in our previous paper [1], p. 20, lasting only one and three hours after injection.

Hence colloidal dyes pass up nerves both by way of the axis cylinders and lymphatic sheaths, but get stopped by the posterior root ganglion. Hence there is a marked difference between the spread of bacteria and colloidal pigments along the afferent nerve at the spinal ganglion. In these experiments the bacteria were non-motile, and did not have the power of multiplication or causing inflammatory reaction, and for these reasons breaking down the defensive barrier that apparently exists to the colloidal dye.

Is tetanus toxin treated like the dye? To elucidate this the following experiments were performed.

(4) *Section of Ventral Nerve Roots.*

Experiment 22.—A cat was anæsthetized, the lumbar cord was exposed, and the ventral roots of the sacral and lumbar nerves cut, so that there was complete paralysis of the hind limb of one side. The wound was sewn up. The whole operation was carried out aseptically. Then the sciatic nerve of the same side was exposed as high as possible, the wound and nerve were carefully packed round with cotton wool, and 0·25 cubic centimetre of strong concentrated tetanus toxin was carefully inoculated into the nerve. The opening was sealed up, the cotton wool removed, and antitoxin poured into the wound, which was then dried with sterile wool. The wound was closed. The animal was kept alive for four days, and showed no signs of tetanus. The animal had perfect sensation in the paralysed leg.

Experiment 23.—As before, only after severing the ventral roots, a longitudinal lesion was made in the lumbar cord on the same side just beyond the entry of the posterior nerve roots. Tetanus toxin was injected as before into the nerve of the paralysed side with the same precautions. The animal developed no signs of motor tetanus or tetanus dolorosus.

Hence we must conclude that the posterior root ganglion behaves to tetanus toxin in the same way as it does to colloidal dyes, and acts as a barrier to the spread, and for this reason tetanus dolorosus does not occur with subcutaneous inoculation or infection.

D.—The Action of Iodine on Tetanus Toxin.

It is generally held that the exposure of tetanus toxin to iodine renders it toxoid, that is, renders it incapable of producing the symptoms of tetanus on inoculation, subcutaneously or intravenously, but capable still of provoking antibody formation.

Now, if we agree with Ehrlich that the antibody is formed especially by the tissues specifically affected by the toxin, we should have to believe that the iodized toxin reaches the central nervous system in the same way as the unaltered toxin does.

The following experiments are of importance both in regard to the action of the iodine on the toxin and the seat of antibody formation.

In these experiments the toxin was exposed to the action of equal parts of Gram's iodine solution for periods of one hour and more.

The minimal lethal doses of the toxin of ten grammes subcutaneously for a mouse was 0·0001 cubic centimetre.

0·25 cubic centimetre of the iodized mixture (one hour's exposure), 0·125 cubic centimetre of the original toxin had no effect on a mouse when inoculated subcutaneously.

To ensure complete removal of the iodine, the mixture was shaken up with cod liver oil, and the clear fluid was tested with the same result.

One cubic centimetre of the mixture produced no effect on subcutaneous

inoculation into a guiuea-pig of 180 grammes. These experiments show that the iodine had so affected the toxin that subcutaneous inoculation no longer produced any symptoms, and, further, that the endeavour to remove any possible excess of iodine by ol. morrhuæ in no way affected this. This was important since it was desired to eliminate the possibility of any free iodine acting on the nerves, etc., in the next experiments.

Experiment 24.—Rabbit anæsthetized under ether, aseptic operation. Both sciatic nerves were exposed and 0·25 cubic centimetre of the above iodized toxin inoculated into each. No result occurred, whereas 0·25 cubic centimetre of the same toxin (*vide supra*, Experiment 19) produced typical tetanus on the inoculated side.

Intracerebral Inoculation of Iodized Toxin.

Experiment 25.—A guinea-pig of 350 grammes was anæsthetized with ether, trephined with aseptic precautions and 0·1 cubic centimetre of the above toxin-iodine mixture inoculated deep into the brain. The wound was then sewn up. The animal developed typical cerebral tetanus in three hours and was then killed.

Experiment 26.—To compare the toxicity of iodized toxin and unaltered toxin on intracerebral inoculation. The iodized toxin was prepared as above. Six large guinea-pigs of about equal weight were anæsthetized, trephined and the following doses of toxin (iodized and ordinary) inoculated deeply intracerebrally as follows, allowance being made for the dilution with iodine.

	Iodized toxin	Ordinary toxin
0·0001 c.c. ..	*Nil*	*Nil*
0·001 c.c. ..	*Nil*	*Nil*
0·01 ..	Typical symptoms in 8 hours	Typical symptoms in 10 hours

Thus the toxic dose of iodized toxin is about the same as for the unaltered toxin (slight difference in site of inoculation allowed for). Hence it must be concluded that in some way the toxic molecule becomes so affected that it is no longer carried up the axis cylinders to the cornual cells, and that which may travel along the neural lymphatic sheaths cannot diffuse through to the anterior cornual cells; but that iodized toxin inoculated directly into the central nervous system is as potent as it originally was. It might be argued that the exposure of the toxin to the iodine was not long enough and the symptoms were due to toxin which had been insufficiently acted on. If this were so, it is peculiar that the exposure for one hour produced no alteration in the minimal lethal dose.

To test this further, mixtures of toxin and iodine were exposed at 37° C. for three hours and six hours and the results were as before, 0·001 produced typical symptoms in ten hours in large guinea-pigs. The other possibility is that the affinity of the brain lipoid is sufficient to absorb all the iodine and so free the toxin which has not been sufficiently long acted upon.

Against this is the fact that exposure to ol. morrhuæ for long periods does not bring back the toxicity of tetanus toxin as evidenced by subcutaneous inoculation.

From these experiments we must conclude that the iodine combining with the toxic molecule prevents it from getting to the anterior cornual cell, either

(*a*) Preventing its ascent along the axis cylinder.

(*b*) Preventing diffusion into the anterior cornual cell of any that may have travelled to the cord along the neural lymphatic glands.

Further they show that, since iodized toxin is used for the production of tetanus antitoxin, and since direct intracerebral inoculation of the iodized toxin produces typical cerebral tetanus, and has no effect when inoculated subcutaneously, the antitoxin must be produced by the tissues other than the central nervous system.

E.—Site of Action of Tetanus Antitoxin.

(*a*) Can the antitoxin pass through the capillaries of the central nervous system to the affected areas?

Ransome and Meyer [2] endeavoured to solve this problem by comparing the neutralizing value of equal amounts of cord from a normal and passively immunized animal. They were unable to solve the question. This method of examination is difficult since

(1) The normal central nervous tissues can neutralize tetanus toxin.

(2) Antibodies on injection go into combination with the tissues in some other state and the extracts of or the ground-up tissues containing them do not react like the original antibodies *in vitro*; and probably react differently *in vivo*.

Tetanus antitoxin is usually obtained by immunizing horses, hence the antitoxin cannot get into the central nervous system unless the horse serum can get there. We therefore tried the anaphylactic method of demonstration of the presence of horse serum in the central nervous system.

Experiment 27.—A series of guinea-pigs of about 250 grammes was inoculated intravenously with five cubic centimetres of normal horse serum. They were killed at intervals, washed out as white as possible with sterile normal saline. The tissues were ground up and injected into guinea-pigs of 180 grammes. After three weeks these pigs were tested to see if they had become sensitized to horse serum.

Guinea-pigs Inoculated with Tissues from Pigs kept Alive for—

	12 hours ..	24 hours ..	72 hours ..	6 days
	After Inoculation of the Horse Serum.			
Brain and cord	*Nil*	*Nil*	*Nil*	*Nil*
Liver	Acute anaphylaxis, death 3 minutes	Acute anaphylaxis, death 3 minutes	Acute anaphylaxis, death 3 minutes	Slight
Spleen ..	Acute anaphylaxis, death 3 minutes	Acute anaphylaxis, death 3 minutes	Acute anaphylaxis, death 3 minutes	*Nil*
Omentum ..	Acute anaphylaxis, death 3 minutes	Acute anaphylaxis, death 3 minutes	Acute anaphylaxis, death 30 minutes	*Nil*

Now these experiments prove that horse serum does not get into the central nervous system. The only possible objection to the experiment may be that the washing out completely removed any horse serum in the tissue spaces of the cord.

Experiment 28.—A further experiment was performed. Two guinea-pigs of about 250 grammes were inoculated intravenously with five cubic centimetres of horse serum, killed after twelve and twenty-four hours, bled, and the brain and cord removed without first washing out. The result was as above.

Experiment 29.—Same as 28 only the animals kept alive two and six hours respectively. The brain and cord of these were incapable of sensitizing guinea-pigs against horse serum.

Now the anaphylactic reaction is a very sensitive reaction, as little even as 0·00001 cubic centimetre of horse serum being required to sensitize an animal.

Hence we must conclude that tetanus antitoxin does not reach the central nervous system by way of the blood vessels.

(*b*) The question of passage of antitoxin from the cerebrospinal fluid into the cord.

This deals with the question of intrathecal inoculation of tetanus antitoxin for the treatment of tetanus. We have already shown by Experiments 8 and 19 that the antitoxin cannot pass from the blood into the cerebrospinal fluid. In order to elucidate this point the following experiment was performed successfully.

Experiment 30.—A large rabbit was anæsthetized with ether, the dura was carefully exposed in the lower dorsal region and two thick soft ligatures were drawn around the dura, gently tightened and a drop of tincture of iodine inoculated into the space between the two ligatures in order to cause adhesions to the dura. The animal recovered well, but had some weakness of the legs. A week later 2·5 cubic centimetres of tetanus toxin were inoculated into the right hind leg. The animal was anæsthetized under ether, the dura carefully exposed in the upper lumbar region, pinched up free from the cord and ½ cubic centimetre of concentrated tetanus antitoxin (500 units) injected into the subarachnoid space. The wound was sewn up and the animal recovered well. No alteration occurred in the tetanus of the affected side for seven days, when the animal was killed.

It was found that there were firm adhesions of the dura to the cord in the dorsal region, so that the tetanus antitoxin had been retained for a long period in the lumbar region.

Experiment 31.—A large rabbit was inoculated with 2·5 cubic centimetres of tetanus toxin into the left hind leg. It developed a typical tetanic rigidity of that limb in forty-eight hours. The animal was then anæsthetized, the subcerebellar space exposed and as much cerebrospinal

fluid as could be was removed and the animal was inverted to empty out as much as possible the spinal fluid.

Then the animal was held vertically with the head up and 2 cubic centimetres of very concentrated tetanus antitoxin (10 cubic centimetres concentrated to 2 cubic centimetres) was inoculated. The animal was kept with the body sloped so that the head was high and the pelvis low.

The rigidity persisted for seven days when the animal was killed. There were joint changes as in the last experiment.

Experiment 32.—2·5 cubic centimetres of tetanus toxin were inoculated into the right leg of a large rabbit. Typical marked tetanus developed in forty-eight hours. The animal was then anæsthetized with ether, the dura carefully exposed in the lumbar region, and 0·5 cubic centimetre of concentrated antitoxin inoculated into the lumbar subarachnoid space. The wound was sewn up, and the animal was quite well but the tetanus remained unchanged in the limb.

Hence there is no evidence of the penetration of the anti-toxin from the cerebrospinal fluid to the cord in the rabbit.

The method of testing for the presence of horse serum in the cord by sensitization of the guinea-pig was not performed since the injection of a foreign serum always produced some local reaction of the meninges, and it is certain that the protein would be held by the cells of the meninges in sufficient quantity to sensitize a guinea-pig.

(c) *Tetanus Anti-toxin Inoculated Intraneurally.*

Ransome and Meyer [2] state that if tetanus antitoxin be inoculated into a nerve it blocks the passage of the toxin up that nerve, also if toxin be inoculated intravenously the injection of tetanus antitoxin into the nerve protects the anterior cornual cells and so the area supplied by that nerve.

Dealing with these statements in order:—

(1) The injection of tetanus antitoxin into the sciatic nerve prevents the occurrence of tetanus in the limb, or at least greatly delays the onset and diminishes the severity of the symptoms. (P. 374, Experiments 2 and 3, p. 375, Experiment 4.) We have been able to get exactly the same results.

Experiment 33.—A rabbit was inoculated with 0·25 cubic centimetre of tetanus antitoxin (250 units) into the right sciatic nerve. Anæsthetic ether. Then 2·5 cubic centimetres of tetanus toxin into each leg.

The left leg showed typical tetanus in forty-eight hours, the right one showed slight symptoms in ninety-six hours.

(2) Intraneural antitoxin protects against cord spread.

Experiment 34.—Similarly to Experiment 5 of Meyer and Ransome, p. 375, protection can be obtained locally by intraneural inoculation of antitoxin in generalized tetanus.

A large rabbit was anæsthetized. The right sciatic was exposed and ¼ cubic centimetre of concentrated (250 units) antitoxin inoculated into it.

The rabbit was then given 2·5 cubic centimetres of tetanus toxin intravenously (0·0001 minimal lethal dose). In thirty-six hours there was marked cephalic tetanus, in forty-eight hours the fore limbs were markedly tetanic, the hind limbs quite free.

In seventy-two hours the left hind limb showed some rigidity, the right was quite free; the animal died next day, the right limb being quite free to the time of death.

Hence tetanus antitoxin appears to protect locally when injected intraneurally against toxin spreading along the cord, as well as against that travelling up the nerve.

In this connexion our previous experiments (*vide supra*) must be borne in mind where normal horse serum or egg albumen produced a great delay in the onset and a diminution in the severity of the local symptoms when inoculated intraneurally.

Again the following experiment is interesting.

Experiment 35.—A rabbit was anæsthetized with ether, the left sciatic nerve was exposed and some iodine was injected into it high up. The animal had no weakness in the limb. Ten days later the animal was inoculated subcutaneously in the front left paw with five cubic centimetres of potent toxin. The animal developed typical tetanus of that limb in twenty-four hours, trunk and cephalic tetanus in forty-eight hours, in sixty hours the right hind limb was affected, but even after ninety-six hours the left hind limb showed no sign of tetanus.

Thus simple blocking of the lymphatics of a nerve also acts in greatly delaying the spread of tetanus to the limb supplied by the nerve whose lymphatics have been blocked. This makes it appear as if the toxin which gets into the general circulation and so gets to other nerves peripherally, plays a great part in the march of tetanus as well as the direct spread in the cord mentioned by Meyer and Ransome, since in this experiment the prevention of this factor locally hindered the occurrence of tetanus in the limb whose nerve was to be treated.

It was next proposed to solve the question, if the antitoxin really ascends the nerve to the cord and thus influences an already affected part, by inoculating horse serum into the nerve and testing the nerve and cord for foreign albumen by sensitization tests.

Experiment 36.—Accordingly a rabbit was anæsthetized, the left sciatic nerve exposed near the middle of the thigh and 0·5 cubic centimetre of horse serum inoculated into it.

After twenty-four hours the animal was killed, washed out with saline, the nerve from the above site of injection to the intravertebral foramina was ground up and injected intravenously into a guinea-pig of 180 grammes, the lumbar cord and nerve roots were similarly inoculated into another guinea-pig. After three weeks the guinea-pigs were tested for hypersensitiveness to horse serum.

Guinea-pig inoculated with cord, etc.	..	*Nil*
,, ,, ,, nerve ..	..	Convulsions, paresis, long delayed recovery

Experiment 37.—The same experiment, only animal kept alive for forty-eight hours.

Guinea-pig inoculated with nerve ..	..	Convulsions, recovery
,, ,, ,, cord ..	..	*Nil*

Hence from these experiments it does not appear that the horse serum travels far along the nerve, and it makes it more probable that by blocking the perineural lymphatics with antitoxin the toxin ascending from the periphery is neutralized and so the summation of the action of toxin ascending the nerve and that spreading in the cord from other parts is prevented with subsequent diminution of symptoms.

Experiment 38.—The following experiment with tetanus antitoxin also shows that the intraneural antitoxin cannot influence anterior cornual cells already affected.

A rabbit received 2·5 cubic centimetres of tetanus toxin into the left leg. Twenty-four hours later, when tetanus had commenced, it was anæsthetized with ether, and 250 units of tetanus antitoxin (concentrated) were inoculated into the right sciatic nerve at the level of the upper part of the thigh. The rigidity in the limb was in no way influenced but became more marked. There was, however, no spread to other limbs.

Experiment 39.—A rabbit received four cubic centimetres of tetanus toxin in the left thigh. Twenty-four hours later, when there was marked rigidity, the animal was anæsthetized and 250 units of antitoxin inoculated into the right sciatic nerve high up. This in no way influenced the tetanus of the left limb; there was, however, no further spread.

In all these experiments it seems justifiable to conclude that tetanus antitoxin is not carried in any degree to the cord either by the axis cylinders or neural lymphatics when inoculated directly into the nerve, but that its sole action when thus inoculated appears to be the local neutralization of the toxin coming up the perineural lymphatic sheath. This appears to be further evidence that tetanus toxin travels in the neural lymphatic sheaths; hence we would conclude that antitoxin acts upon the toxin in the circulation and tissues, and prevents its spread from thence into the nerves and central nervous system, and that it has no effect on the toxin already travelling along the nerve and that in the central nervous system.

Summary.

The experiments recorded in this paper show—

(1) That although tetanus toxin ascends to the central nervous system by way of the axis cylinders of the nerves, it also to a very great extent passes up the nerves to the cord by way of the perineural lymphatics. Blocking of the latter paths greatly delays and in some cases completely

prevents the occurrence of tetanus in the part corresponding to the nerve whose lymph path has been blocked.

(2) Although tetanus toxin passes rapidly from the blood vessels into the connective tissue spaces and thence to the thoracic duct, the toxin does not pass from the capillaries of the central nervous system to the tissues thereof.

(3) Tetanus toxin does not pass from the choroidal plexus to the cerebrospinal fluid.

(4) Although bacteria can pass through the posterior root ganglion to the cord, colloidal pigments and tetanus toxin are prevented from doing so.

(5) Iodine, although it prevents tetanus toxin from producing its characteristic effects when iodized toxin is inoculated subcutaneously or intravenously, does not affect the toxin when inoculated intracerebrally, it does not hinder the occurrence of the typical symptoms of cerebral tetanus, and there is no apparent diminution in its toxicity.

(6) Tetanus antitoxin does not pass to the central nervous system either by way of the blood vessels, axis cylinders, or neural lymphatic channels. It also cannot pass from the cerebrospinal fluid when inoculated intrathecally into the substance of the cord. The antitoxin simply acts by combining with the circulating toxin, and that at the seat of production, and prevents it from reaching the central nervous system. The toxin already in this position is unaffected.

[1] Teale and Embleton. *Proc. Roy. Soc. Med.*, London, 1914, vol. v, pp. 69-96.
[2] Meyer and Ransome. *Arch. f. exper. Path. u. Pharmakol.*, Leipzig, 1903, Bd. xlix, SS. 367, etc.
[3] Orr and Rows. *Edin. Med. Journ.*, 1916, vol. xvii, pp. 78-89.
[4] Golla. "Report to the Tetanus Committee," War Office, 1917.
[5] Marie and Morax. *Ann. de l'Inst. Pasteur*, Paris, 1902, tome xvi, p. 818.
[6] Bruschettini. Quoted by Meyer and Ransome, *vide supra* [2], p. 372.
[7] Metchnikoff. *Ann. de l'Inst. Pasteur*, Paris, 1898, tome xi, p. 89.
[8] Homen. "Arb. aus dem Path. Institut zu Helsingfors," 1905, Heft 1-2, Bd. i, S. 12.

A NOTE ON SICK WASTAGE.

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The success of the Medical Service with an army in the field may fairly be judged by the incidence of sickness, and by the proportion of the sick who require to be evacuated to lines of communication. It is not within the scope of this article to discuss preventive medicine generally. It is sufficient to say that preventive medicine has an enormous field to cover, and that it requires men of broad vision to envisage a war beforehand, and to adopt measures calculated to deal with possible or probable difficulties. Prophylactic vaccination, so conspicuously successful in preventing the enteric infections may, for instance, well be extended to deal with pulmonary and numerous other diseases.

The following table was compiled in 1917 from the returns of certain casualty clearing stations in France which tendered a monthly summary of their sick admissions, and the principal diseases which led to such admissions.

Analysis of Sick Admissions for One Year.

A		**B**	
Scabies	10,736	P.U.O.	15,392
I.C.T.	10,284	Trench fever	5,244
Skin diseases	4,534	Myalgia	4,755
Boils	1,325	Rheumatism	633
	26,879		26,024
C		**D**	
Debility	2,535	Diarrhœa	3,913
Cardiac	2,587	Dysentery	1,821
		Gastro-enteritis	599
	5,122		6,333
E		**F**	
Influenza	3,627	Eye	1,073
Bronchitis	3,461	Ear	1,408
Pneumonia	751	Hernia	1,305
Pleurisy	635	Piles	1,349
Tubercle	258	Varicose veins	97
Laryngitis	431	Dental	2,606
Tonsillitis	1,422	Appendix	698
	10,585		8,536
G		**H**	
Measles	785	Neurasthenia	381
Mumps	446	N.Y.D.N.	3,296
Diphtheria	38		
	1,269		3,677

Local injuries	5,548	Trench foot	3,294	Nephritis	1,626	Venereal	6,742
Synovitis	456						
	6,004						
Unclassified	446						

Total admissions to C.C.S.s for "Sickness" were 106,267.

With certain modifications the above figures may be taken as representing proportional wastage from sickness in the army concerned, and in the main is probably correct for the whole of the armies at this period. Further, excepting certain diseases which at times were epidemic in character, as influenza in 1918, or the high incidence of nephritis in 1915 and 1916, it may be taken to indicate fairly accurately the causes of sick wastage during the campaign.

Certain fallacies due in the main to administrative changes must, however, be allowed for. Scabies, for instance, was during the period under review only treated in casualty clearing stations during eight months, for the remainder of the time the treatment being carried out under divisional arrangements.

The number shown, therefore, does not indicate the complete incidence of scabies, nor the true percentage in the total rate. Similar instances, though to a lesser degree, might be quoted.

Accepting the figures as being in the main a correct representation of the sick incidence in the armies, it is worth while to study them more closely, with the view to ascertaining how far the causes of wastage were preventable.

It will be noticed at once that groups "A" and "B" accounted for about one half of the total. Of skin diseases, almost the whole were due either to scabies or to a pyodermic condition, which in many cases was the direct result of scabies, from the scratching and introduction of organisms arising therefrom. Now scabies is eminently a preventable disease. It is not highly infectious, the acarus having a very limited range of movement, and continued close contact seems to be a necessary factor for spread. With careful inspection at sufficiently close intervals, by medical officers trained to know where to look for the early infection which in the field is in a great majority of cases on the buttocks or genitalia, scabies should not spread nor be allowed to become responsible for the enormous wastage which it caused. Whilst eminently a tractable infection in the early stages, before a secondary pus infection is established, it becomes a most intractable and prolonged disablement if neglected.

Cases of uncomplicated scabies should be cured in six days, or, allowing one day for "going sick" and one day for returning to duty, should be back with their units in about a week.

Once a secondary impetigo is established, weeks elapse, and it was found in France that a minimum of thirty-one days was required to effect a cure in those cases which were so severe as to necessitate evacuation. This meant that for the greater part of two months such cases were away from duty.

The omnibus diagnosis "I.C.T." covered a multitude of lesions, including seborrhœa, the results of scabies, infected abrasions, etc. Here again frequent inspection and prompt early treatment would have prevented or have cut short the wastage.

The subject was fully discussed at a meeting of the Fourth Army Medical Society, and many interesting points of treatment were mentioned. The wearing of clean underclothing was emphasized as an essential point in prevention.

Skin diseases, apart from the common conditions already mentioned, were uncommon in France, and formed a negligible proportion of the total. The main fact that emerges from a study of this group, is that some twenty-five per cent of the sick wastage was due to simple skin lesions, that of these the vast majority were due to scabies or some form of pyodermia, and as such were very largely preventable by careful inspection and by personal cleanliness of the men, and that even where infection was established, prompt treatment was efficacious in greatly reducing the loss of time. The question of cleanliness will be referred to again.

Group "B" contains another mass of cases collected together under one heading, as the majority of them were in reality trench fever, and they account for another twenty-five per cent of the total.

It will be seen that trench fever so diagnosed only accounts for some 5,000, but undoubtedly a very large number of the cases called P.U.O. were in reality trench fever. The writer frequently sampled such admissions and came to the conclusion that at least eighty per cent of them were in reality trench fever.

The same remark applies to the loose diagnosis of myalgia. The diagnosis of cases by symptoms, whether it was pyrexia or muscular pain, so frequently obscured the real issue, that the final statistics of the war will not present any real indication of disease in the Army. Myalgia was, in from seventy to eighty-five per cent of all cases, according to various skilful observers, in reality an apyrexial phase of trench fever. Out of the total of 26,000, a conservative estimate would indicate that 20,000 were really cases of trench fever.

With the knowledge we now possess as to the methods of spread of this infection, a knowledge which had been surmised on theoretical grounds long before experimental work finally inculpated the louse as the vector, it is clear that trench fever is a preventable disease. Prevention again consists in inspection for infestation and in proper provision for clean underclothes, bodily cleanliness and disinfestation.

Lastly, in this connexion take group "C," in which cardiac conditions and debility are grouped together, and furnish another 5,000 cases. Of these a definite proportion, variously estimated at from twenty to over fifty per cent, originated in trench fever, and should be included in group "B." Taking 1,500 as being directly caused by this infection, we arrive at a total of 21,500 cases of trench fever, and adding to this total the 25,000 skin lesions originating in dirt, "dirt disease" is seen to be the cause of 46,500 cases, or forty-four per cent of the total incidence.

This mass of cases, so largely preventable, was a very serious factor in lessening the man power of the Army. The methods of prevention were

comparatively simple—careful inspection at frequent intervals, clean underclothing, bathing facilities and disinfestation. The evolution of laundries, at first run by field ambulances and gradually taken over by the armies, went a long way to providing the clean underclothing. So also the baths, which ultimately were on a scale sufficient to bath every man once a fortnight. Disinfestation was the crux of the problem. In future wars, if the lesson be learned, a standard type of disinfestor will be essential for every unit. To obtain the best results, moist heat is required, not necessarily under pressure. When that standard type is produced, and when each soldier can be bathed, issued with clean underclothing, and have his outer clothing and equipment disinfested, all simultaneously, we shall have arrived at a position where we can confidently expect that the "dirt diseases" will be largely eliminated from the Army.

If some visionary could have foreseen the havoc the louse and the acarus would play, and had devised methods for their destruction, which could have been employed from the outset of war on an adequate scale, what a different story would have been unfolded in the medical history of the war.

Of the remaining groups, only a few require comments. Group "D" shows a small number of cases of dysentery, but the figures were compiled from part of the Northern area, in which in 1917 dysentery was not prevalent. It will be remembered that until the fighting on the Somme in 1916, dysentery was only sporadically seen in France, and it was not until 1918 that the infection was epidemic all down the line, from movements of troops containing "carriers," more particularly drafts from the Eastern Front. It is probable that many of the so-called diarrhœas were in reality true dysenteric infections in mild form, for the establishment of a more complete bacteriological investigation showed that dysentery might be so mild, that even the most skilful clinician was unable to state definitely whether the specific infection was present or not.

Group "E" might be regarded as consisting of inevitable infections, but it would be unwise to take this view, having in memory the prophylactic vaccination against pneumonia which was carried out amongst the native troops in the French Army, and which had striking results; and also isolated examples of the value of this vaccine prophylaxis in the American Armies.

Group "F" contains a variety of cases of which a very considerable number went to form the floating hospital population which was such a problem in the later stages of the war. Many of these men were enlisted owing to errors made by the medical boards in England, and having once been drafted to France, repeatedly went sick on being returned to duty, and performed a circuit of field ambulance, casualty clearing station, base hospital, convalescent camp, and return up the line. Disabilities which in civil life do not prevent a man from being a wage earner, may on active service be a bar to fighting efficiency. Recruiting boards require know-

ledge that can only be obtained by service in the field, as to what will and what will not interfere with a man's efficiency as a soldier. Should a man slightly affected enter the Service, he will, when the psychological stimulus of enthusiasm and interest in new surroundings has worn off, quickly become a hospital case, and it is only possible to make use of his services either by operation to render him fit, or by placing him in some work where he can carry on despite the disability. For this reason, standing medical boards at the bases, composed of men experienced in the needs of the front line, and having specialists in eye and ear diseases, cardiology and neurology, would appear to be essential. The remarkable results which followed the establishment of such boards in the Egyptian Expeditionary Force, are well worthy of study, for they present an unanswerable argument as to the value of such a board of reference for this large group of cases, whenever an army takes the field.

Finally, the question of venereal disease is one which may eminently be regarded as preventable. Concerted efforts for prophylaxis, and for systematic instruction of the men, were commenced in the later part of 1917, and the results obtained were gratifying and encouraging in the extreme. Regimental medical officers were instructed that a very essential part of their duty was that the men under their care were fully warned, both as to the results of venereal infection, and the prophylactic methods available; and it should be a part of the regimental administration to see that these methods are available at all times on a sufficient scale for the unit concerned.

B.

The treatment of the sick in an army area is one which involves the consideration of many principles. Where war is mobile, not much departure from those laid down in pre-war manuals has been found possible, but in trench warfare an entirely new set of conditions arises. The evolution of the casualty clearing station is an interesting study of progress. In the early days of the war the clearing stations acted solely as their title would indicate, being stationed at rail head, receiving from the field ambulances and evacuating to lines of communication. The scale of equipment at that time was such that only emergency operations could be performed, and few cases could be retained for treatment. As the line stablized, so did the scope of the casualty clearing station enlarge, for it was seen that *early* surgery was essential if gas gangrene were to be avoided, and lives and limbs saved. The staffs were therefore strengthened by the inclusion of selected surgeons, whose tenure of appointment was to be regarded as secure, and the equipment was increased to a scale adequate for all needs.

At the end of the war the casualty clearing station zone was by far the most important from the medical and the surgical point of view, for, simultaneously with an increase in surgery, the medical cases were also

retained and treated. From being merely a centre for evacuation, with the urgent surgery being performed in the field ambulances and all else at the base, the casualty clearing station had now become the vital centre of professional activity, and in its equipment was probably better provided for than the base hospitals.

The change of name from clearing hospital to casualty clearing station took place about this time. (It is interesting to speculate on what would have been the effect of a reversion to the old title of field hospital, more descriptive of the duties undertaken, and not so likely to cause confusion as to the real work performed, which was not solely that of "clearing.")

The development outlined above had necessarily been accompanied by some loss of mobility, for the essential equipment amounted to many truck loads. The loss was, however, apparent rather than real, for by abandoning many of the heavy stores, the equipment needed for urgent surgery, and a certain amount of tentage for temporary cover could still be moved. Much of the transport needed was required for moving tentage, etc., which under pre-war schemes was not contemplated, in that it was expected that casualty clearing stations would mainly be housed in buildings. In the event of a retirement the heavy stores might be lost, but to regard this as an argument against their issue to casualty clearing stations is to adopt a narrow view. To take a concrete example, an X-ray plant costing about £300 would probably have to be sacrificed. The financial loss so involved is not comparable with the gain from even a few weeks' work of the plant in making operations accurate and so saving life and limb and thus reducing the pension list.

It is now universally conceded that for the wounded adequate surgical treatment in the army area is imperative, and this implies adequate equipment, tentage, hutting for the winter, etc., as the severely wounded must be retained for a varying period after operation.

The problem of the sick presents different features, in that the immediate urgency is less except in the proportionately small number of cases of pneumonia, nephritis, etc., to whom a railway journey, especially in the winter when the heating of the trains is likely to be inadequate, is a very serious matter. It is however numerically a larger problem; therefore it is necessary to consider how far it is expedient to treat these cases in the army area, or to send them on to the base. On the one hand it is argued that men treated at the base do better than those retained in the forward areas owing to the comparative quiet and safety. This argument, however, lost weight as the bases were increasingly subjected to hostile aircraft attack. The underlying military principle of keeping the army zone clear of sick men is also rightly advanced. On the other hand the whole question of treatment at the base needs to be considered. It was a general experience that the sick man who left the army zone was on the whole less anxious to get well than the man who was retained. He was one stage nearer England, the goal of everyone's desire. His natural tendency

was therefore to exaggerate rather than to minimize his condition of illness. Further, just as the forward zone must not be allowed to get overcrowded, equally it is necessary to keep a reserve of beds at the base, which often necessitated transference to England of hundreds of light cases who would shortly have been fit for duty.

Every stage of evacuation means greater delay in return to duty, whether it be from field ambulance to casualty clearing station, from casualty clearing station to base, or from base to England. At the base, return to duty implied passing through a base reinforcement depot after convalescence was completed. Creating no unnecessary delay, yet nearly a week longer must be spent in travelling down, drafting from hospital to convalescent depot, travelling up again, delay in corps reinforcement camp, and then posting to a unit, than would be required if discharged direct to duty from a casualty clearing station. If the man was sent to England, the delay was far greater. The drafting from a general hospital to an auxiliary hospital, the return thence to a general hospital for despatch to a command depot for convalescence and hardening, then the customary sick leave, the return to the regimental depot, passage overseas, the return to the front, all consumed much time. Even if this itinerary were conducted with the utmost despatch delay would be considerable. Unfortunately, it was agreed by all who had experience that the delay in the auxiliary hospitals was often greater than it should have been. Numerous examples could be quoted of men lost to duty for months by their unnecessary retention in these hospitals.

The whole question of the upkeep of man-power depends on the rapid return to duty of casualties, sick or wounded, and the further forward they are treated the more rapid will be the return. The establishment of the base convalescent depots did much to prevent leakage to England, but they quickly became congested. Similar arrangements in the army zone are very helpful. The experiment tried in the Fourth Army during the winter of 1917-1918 of allotting one casualty clearing station to each corps as a convalescent centre, where convalescents were treated, hardened and returned direct to duty, was a striking success. Some 20,000 men were so handled, of whom at least half, and probably more, would otherwise have been evacuated in the ordinary course of events. During eight weeks of this winter, the evacuations to the base of sick cases comprised the following percentages of total sick admissions to field ambulances. :—

First Army	64·2 per cent.
Third Army	60 ,,
Fourth Army	45 ,,
Fifth Army	42 ,,

For part of the period the Fifth Army was not in the line in any great strength, whereas the Fourth Army, holding perhaps the worst part of the line, with an attenuated strength was, owing to its corps

rest stations, able to keep its evacuations far below those of the other two armies.

The stiffening of morale is also important, for, as stated above, evacuation tends to lower morale, and a state of "hospitalization" is easily acquired and extremely hard to overcome. Undue sympathy, whether from the nursing staff or from lady visitors in the English hospitals, whilst quite natural and very pleasing to experience, has bad effects, and the "poor fellow" who is told he has "done his bit" soon agrees, and feels disinclined to do another.

The cost of transporting this huge army of men is considerable, for even a journey to the base and back probably cost £2. If the corps rest stations mentioned above saved the transport of 1,000 in one winter, that meant a saving of £20,000, at an expenditure of a few hundreds for extra accommodation.

Another point to weigh is that return to duty from a casualty clearing station means that the man goes back to his own unit. Whilst efforts were made at the bases to secure this, it was not by any means always possible to arrange, and the man who returned to his own battalion or battery was probably far more useful immediately, than a man, however well trained, who came new to a unit, and required to learn all the small points of custom and habit which bulk so largely in the successful handling of men.

From the point of view of saving of time, of saving of morale, of saving of money and of preserving the tradition and custom of a unit, it would appear that the treatment of the sick in the forward areas gives the better results.

Clinical and other Notes.

NOTES ON HONG KONG AS A MILITARY STATION.

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A few notes on Hong Kong from one who has been stationed there for the last six years may be of use to officers about to proceed to that Colony.

The Colony consists of the Island of Hong Kong, about eleven miles long and two to five miles wide, with hills ranging up to nearly 1,800 feet; and of the New Territory with about 376 square miles on the mainland, including Kowloon, and about ninety square miles on outlying islands. The harbour comprises an area of ten square miles.

To start with, let me congratulate anyone who is lucky enough to have the chance of going there. His first impressions of Hong Kong will never be forgotten: the stately high-pooped junks with their picturesque tattered and patched sails lazily gliding by in the light breeze of the early morning; the bustling little sampans with the inevitable old woman in her blue coat and black trousers "yuloing" in the stern, with the inevitable baby slung on her back in such a way that its head jerks backwards and forwards with each stroke of the "yulo" as if its neck were broken: the first sight of Chinatown from the tram as one ascends the Peak, with the roofs of the houses looking like barnacles clustered on a rock: the first night view across the Harbour, with its myriads of dotted lights: but one might go on indefinitely. Suffice it to say that the scenery of Hong Kong is unsurpassable and never to be forgotten.

There is nothing to be alarmed about in the climate; for four months in the year it is delightful, for another two months it is quite pleasant, and for the remaining six months it is unpleasant but nothing more. The extreme dampness of these six months is what makes it unpleasant, the relative humidity ranging from about 70 to 90 per cent, the mean temperature during the same period ranging from about 65° to 82°. The maximum temperature in June, July and August (the hottest months) is usually below 90°. The nights are relatively somewhat hot, except at the Peak, where they are always quite bearable. At the lower levels an electric fan is generally required at night for about three months, but electric current, though more expensive than at home, does not make up any considerable item in one's expenditure, and all houses are well "wired."

The sun's power in the hot weather is nothing like so powerful as in India, and outdoor exercises are freely indulged in during the summer, though sun hats are necessary. In the cold weather, when as a rule for days on end the skies are blue and there is a pleasant north-easterly monsoon breeze blowing, one feels it is a pleasure to live. Furs are freely exhibited at this time and greatcoats are a necessity. The temperature goes down quite near to the freezing point at night, especially at the Peak.

There is some difference of opinion about the relative merits of the Peak and

the lower levels as regards suitability for residence throughout the year. For women and children there is no doubt that the Peak is the best place to live. As a rule it may be said to be about 5° cooler than the lower levels of Hong Kong, the air is fresher and it is much less noisy. Kowloon is cooler than the lower levels of Hong Kong, and there is usually a breeze off the sea, but it is not so cool as the Peak. The bad time at the Peak is in the spring, when it is often for days together wrapped in a thick wet blanket of mist. This mist does not extend down to the sea level, and the harbour may be bathed in sunshine while the Peak and other heights are hidden from view. Most of the houses at the Peak are at a height of about 1,400 feet. There are many houses built on the slopes at an altitude of about 500 feet which are below the mist level and yet above the stuffy atmosphere of Victoria, but unfortunately it usually means a slow and monotonous journey in a chair to reach them.

The housing question in Hong Kong is a very serious one. Houses are becoming more and more difficult to obtain and there are very few Government quarters. House rent is steadily rising, rents of $120.00 to $150.00 (with thirteen per cent added for taxes) are asked for the type of house or flat suitable for a married officer. Furnished houses or flats at from $200.00 to $300.00 a month are fairly often obtainable for periods of six months or more, especially in the hot weather when many of the civilians are away on holiday in England or elsewhere. Lodging allowance in Hong Kong is $2.50 to $4.00 for a captain, Royal Army Medical Corps, and $4.00 to $5.00 for a major, Royal Army Medical Corps, the higher rate in each case being for residence at the Peak and the lower rate for Kowloon and the lower levels, but it will be found that residence at the latter places is just about as expensive as at the former.

Items of house expenditure include $20.00 for a cook, $16.00 for a personal servant, $16.00 for a house boy, $12.00 for a house coolie, $15.00 for an amah, $10.00 for a gardener. There are also chair coolies to be paid for if a private chair is kept. A piano costs about $14.00 a month, good ones can be obtained.

Food in Hong Kong is very good and varied. Butter and milk are excellent, there is a pure water supply, eggs are plentiful, the meat supply is good in quality and varied in kind, and fruit of many different varieties can be obtained all the year round. Gardens can be made to grow a very good assortment of flowers and vegetables, and flowers for table and house decoration can be bought cheaply in the market. Uncooked vegetables from the market are not safe.

There are various boarding houses or private hotels, but they are expensive and not very comfortable. The Peak Hotel is about the cheapest place to live at, but it is not fitted with electric light or fans. The Hong Kong Hotel is the best one in the place, but it is generally full up during the tourist season. To the newcomer who has to get in somewhere at once, the hotels named are the best places to make for while having a look round, and it is as well to engage rooms on ahead if possible. There is a cable tramway to the Peak, and luggage is carried up by coolies, taking about two hours or more.

Clothing.—Practically everything can be obtained in Hong Kong and of good quality, but prices are high, especially when the dollar is soaring. It is as well to bring out a good stock of ordinary clothes such as would be worn in England, a tweed suit or two, and a thick and a thin blue serge. Khaki drill, white mess kit, white duck trousers and thin summer suits are best obtained locally. Dress

clothes from home are a necessity, with an extra pair of thin trousers, as these are worn here in the hot weather with a short white coat of a similar cut to that of a mess jacket. The provision of a suitable mackintosh is a matter of considerable importance. The heavy rain comes in the hot weather. The ordinary showerproof coat is useless and lasts a very short time out here. The best type of rainproof coat is one of the thin silky variety coated with shiny waterproof material on the inside. The transparent coats are good for a time, but become sticky.

Hong Kong is a gay place with lots of dances and dinner parties, so plenty of frocks are required by the womenfolk. There are various opportunities for wearing smart day frocks as well, especially at the races in the spring and at the bigger garden parties, but day costumes are not required in the same numbers as evening ones. Plenty of washing sports costumes are also a necessity as lawn tennis is played all the year round, and there is golf galore. Furs should be brought as they can be stored in cold storage during the hot weather. A becoming bathing costume is a useful addition to one's wardrobe, but it is not worth while bringing riding kit unless one is very keen on riding, as there is very little to be had here. Silk articles and materials brought from home soon become brittle.

Sports and Amusements.—Cricket, hockey and football during the cold weather. Lawn tennis, mostly on grass courts, all the year round. Golf on one excellent golf course at Fanling, and on two or three others not nearly so good, but more handy to get at. Polo on Chinese ponies, very indifferent after India; ponies cheap to buy, but relatively expensive to keep, Yachting of excellent quality, with plenty of racing for the smaller yachts in the cold weather, and with cruising as well for the larger ones all the year round. Yachting is a relatively cheap amusement in Hong Kong and gives excellent sport. Bathing of the best from about April to October, mostly in parties from launches moored near a suitable beach. Fishing is not commonly indulged in, but there is both sea and a little river fishing to be had by anyone who is keen. Shooting is not good unless one can get away some distance, as it is much too crowded close to the Colony, but the keen man can go out and pick up a few birds fairly close by as soon as he knows the ropes. A license is necessary. Snipe, quail, partridge, teal and woodcock are obtainable. There is no ground game.

The standard of excellence in games in this Colony is a high one, and there is keen competition between the services and the civilians, a competition which fosters a spirit of good fellowship all round.

Motoring.—Two really good roads have recently been opened—one round the Island, a distance of about twenty-five miles, and the other round the new territory on the mainland, a distance of about sixty miles. On both of these roads the scenery is magnificent, the surface is excellent and there is very little dust. Cars are becoming very numerous in Hong Kong, mostly American cars of the better makes. Small cars will not stand the numerous turns and twists on the hilly roads, and a high powered car is a necessity. Except for motoring, travelling in Hong Kong is a slow business. There are no "tum-tums" with their dapper little ponies as in India. At the Peak the usual mode of conveyance is the "chair," though rickshaws are possible on some of the roads. At Kowloon and the lower levels one gets about in a rickshaw or a tram, or on foot. Crossing the harbour when dining out, one has to travel some distance to reach the ferry

r the Peak tramway and again to reach the destination on the other side, the total journey takes about as long as getting from London to Brighton.

Hong Kong may be considered a relatively healthy tropical station. Children get on well as a rule. There is a school at the Peak. A disadvantage in the station is that there is no place where it is easy to get to for a few days' change in the hot weather. A sea journey is necessary to get away at all, and there is always the chance of meeting very bad weather at that time of year. For longer periods of leave there is a considerable choice; Japan can be visited comfortably within the sixty days' privilege leave; North China, with all its places of absorbing interest, is also available but is very hot in the summer and very cold in the winter. Many people go to Wei-hai-wei for the whole of the hot weather, and it is also the summer station for the Navy. Tsingtau is a pleasant little summer resort with excellent bathing facilities. The big game enthusiast can obtain fair sport by proceeding to Saigon and working up from there. Occasionally the Royal Army Medical Corps Officer can obtain a pleasant and profitable holiday, if he is a good sailor, by obtaining the berth of ship's surgeon for a suitable trip.

Now to come to the eternal dollar question. While I have been here I have known the rate of exchange for the dollar as low as sterling 1s. 9d., but at the present time as I write it has soared to the record price of sterling 5s. 5d. When it is considered that its purchasing power is practically the same whatever the rate of exchange may be, it can soon be realized that the man who tries to reckon out his expenditure constantly in terms of sterling will soon be a fit aspirant for a lunatic asylum. The fact of one's pay and some of one's allowances being paid in sterling, and with only a modified concession towards a sterling 2s. 0d. dollar, necessarily makes the poor officer's financial lot out here similar to the lot of the policeman in the "Pirates of Penzance," but if I am finishing up this article on a note of pessimism I must ask the reader to turn back to the paragraph at the beginning and take the rough with the smooth.

One little piece of financial advice I will give, and one only. Bring out any money you may be bringing on a letter of credit, then you can wait in hopes that the dollar will do you a good turn some day before you have cashed the whole sum.

THREE YEARS' EXPERIENCE OF APPENDICECTOMY.

By Lieutenant-Colonel G. H. YOUNGE.
Royal Army Medical Corps.

On March 31, 1918, the Military Hospital, Grantham, one of the new war hospitals equipped with 620 beds, completed three years' work.

On looking over the records of operations I find that, during these three years, appendicectomy was performed 180 times and it has occurred to me that some brief notes of our cases may be of interest to readers of our Journal. It is also hoped that their publication may elicit a similar record from other hospitals.

Looking at the figures I think there can be little doubt that appendicitis has been unusually prevalent amongst the troops here and the question has been frequently debated as to how this unusual prevalence is to be explained.

There has been a distinct impression amongst the medical staff that it was in some way connected with the use of tinned foods, but no actual proof of this has been elicited.

The following table gives the incidence of the disease month by month :—

APPENDICECTOMIES.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL
1915 ..	—	—	—	0	1	5	11	11	2	0	3	5	38
1916 ..	10	3	6	3	2	3	3	2	4	7	2	6	51
1917 ..	6	1	9	4	5	2	5	13	6	6	7	6	70
1918 ..	3	11	7	—	—	—	—	—	—	—	—	—	21
TOTAL ..	19	15	22	7	8	10	19	26	12	13	12	17	180

The exceptional prevalence of appendicitis during February and March and again during July and August is curious, the admissions during these four months equalling 45·5 per cent of the whole.

If there is any truth in the tinned food supposition the explanation would probably lie in the direction of some bacterial taint and the prevalence of appendicitis during the months of July and August lends some support to this theory. Opposed to it, however, is the prevalence of the disease during February and March, when bacterial growth is presumably at a minimum.

In a large majority of the cases the symptoms were well marked and characteristic, so that there was rarely any difficulty in diagnosis. In a large proportion also the rapidity of onset was remarkable, so that it was possible to fix almost the exact moment at which the illness started. Equally remarkable was the rapidity of the pathological changes. In twenty-one per cent of the cases the appendix was found more or less gangrenous, a condition which had supervened in from six to twenty-four hours from the first onset of the symptoms. Several of the cases were so rapid as to merit the term fulminating. In one case, for instance, the patient fell ill on parade at 6.30 a.m. *Some twenty minutes later* he was suddenly attacked by violent pain in the iliac region. He was at once placed on a stretcher and carried to hospital, which was less than a quarter of a mile distant. On arrival there he was found to be collapsed. Suitable restoratives were applied *and he was operated on as quickly as possible.* The appendix was found to be completely gangrenous and he died at 3 p.m. from general peritonitis.

Captain Ritson lays stress on the fact that the severity of the signs and symptoms is by no means invariably a certain guide to the intensity of the pathological processes in the appendix, e.g., in some cases in which the appendix was gangrenous the signs and symptoms gave no indication of the grave pathological condition. He also dwells on the fact that a case, which began quite mildly, might suddenly become fulminating without any apparent reason.

The condition of the appendix as revealed at the operation is of interest. It was gangrenous throughout in twenty-one per cent of the cases. In the remaining seventy-nine per cent it was acutely inflamed. The inflammatory changes were limited to the mucous lining of the appendix in fifteen per cent of the latter, whilst in sixty-four per cent the inflammation chiefly involved its peritoneal aspect. In several of the former the mucous membrane was gangrenous in patches.

Definite fæcal concretions were present in fifteen per cent, these varying in size from a grape seed to an almond and closely resembled these bodies in size and appearance. In a further twenty per cent of the cases liquid fæces were found in the appendix. In not a single case was any foreign body discovered. A local abscess was present in thirteen per cent of the cases, whilst in one case an abscess was found in an adherent omentum, and in another in the walls of the appendix itself.

Operation.

The invariable rule adopted was to operate with the least possible delay as soon as a diagnosis of acute appendicitis was established, and this, I feel convinced, is the only safe procedure.

In two cases in which the patients at first refused operation their lives were sacrificed, although the delay was only a matter of two or three hours. Situated as we were in a large garrison, where every man was under constant medical supervision, one would naturally expect to see the cases within a few hours of their origin. This was far from being an invariable rule, however, and in the majority periods of from twenty-four to seventy-two hours elapsed before the cases reached the hospital. To revert to actual figures, thirty-two per cent were operated on within twenty-four hours and sixty-eight per cent within periods which varied from twenty-four to seventy-two hours from the onset of the symptoms.

Discussing the operation Captain Ritson writes: "With regard to the operation performed, in all the cases, with a single exception, the appendix was removed at the primary operation, even in the presence of an abscess. In the exception, the appendix, which was retrocæcal and retro-peritoneal, was removed at a second operation, as it could not be found at the first when an abscess was opened and drained. The removal of this appendix was decided upon, although the abscess had closed and all symptoms had subsided, because, a short time previously, an interesting case of appendicitis with a somewhat similar history had been admitted and treated in the hospital. This latter case, a youth of about twenty years, was admitted with symptoms and signs of a severe attack of acute appendicitis. He presented, however, a scar in the right iliac region and stated that two years previously he had been operated on in a civilian hospital for appendicitis, and that at this operation an abscess was drained and the appendix was removed. He was perfectly definite upon the latter point and the appearance of the scar corroborated the first part of his statement. In spite of this history it was decided to operate and the abdomen having been opened through the old scar, a globular, acutely inflamed appendix about one inch and a half in diameter, full of muco-pus, was removed. Whether or not this structure was the entire appendix or whether it was the inflamed remainder of a partially removed appendix I am unable to say, but certainly the case emphasizes the rule that a diseased appendix should always be completely removed, and not its results, e.g., abscess alone, treated. Alternatively, the patient in whom an abscess only has been treated and drained should be clearly informed that he still retains the appendix in view of the possibilities of the development of further trouble."

"Respecting the incision employed, in all the cases in which from a con-

sideration of the symptoms and signs, it was reasonable to assume that an abscess did not exist and that the disease was still limited to the appendix, the McBurney (or McArthur) incision was used. This incision is undoubtedly the incision of choice. It inflicts a minimum amount of damage on the muscles of the abdominal wall and thus diminishes the risk of ventral hernia. It falls together naturally and leaves only a small dead space on sewing up, thereby lessening the danger of wound infection and the period occupied in healing. It also affords, as a general rule, adequate space for the removal of the appendix. Should the space allowed prove too limited it may easily be enlarged by a vertical incision through the anterior sheath of the rectus with retraction inwards of the outer edge of the latter."

"In only one of my cases did the McBurney incision, even with the addition of the above mentioned modification, prove inadequate, and in this case it was necessary, to permit of removal of a gangrenous, adherent appendix, to split the muscles of the abdominal wall in the usual fashion about three inches above and parallel to the typical incision. When, from the length of time that had elapsed since the onset of the symptoms, or from the presence of a tumour in the right iliac fossa, there was reason to believe that there was an abscess, the right rectus or Battle incision was employed. This incision gives an excellent view of the contents of the right iliac fossa and, should an abscess be present, of its relations to surrounding parts. The abscess may be more certainly packed off from the rest of the abdominal cavity and thus dissemination of infective material be more certainly prevented, through this incision than through any other. The rectus incision was used also in all cases in which there was a doubt in the diagnosis, as it may be so easily extended upwards in case of error. Altogether the rectus incision was employed in thirty-six of my cases. In three the abdomen was opened through the right linea semilunaris; while in one—in which a diagnosis of acute abdomen only was made—the abdomen was opened in the median line below the umbilicus."

Results.

Of the 180 *cases three terminated fatally.* The first of these has already been described. The second was operated upon on the third day. The appendix was found completely gangrenous and a local abscess had ruptured into the general peritoneal cavity. The patient died within a few hours of the operation from general peritonitis. The third case was operated upon in the second twenty-four hours for acute appendicitis, but died on the fifth day after the operation with symptoms of intestinal obstruction and toxæmia in spite of free intestinal drainage through an intestinal fistula.

Of the remaining 177 cases two were permanently invalided from the service, whilst 175 returned to duty. The results are distinctly gratifying and may, I believe, be mainly, if not entirely, attributed to three conditions, namely: (1) The invariable rule adopted to operate with the least possible delay in every case of acute appendicitis. (2) The complete removal of the diseased appendix at the primary operation. (3) The great care invariably paid to the peritoneal toilet.

Conclusion.

During the period under review three officers held at different periods the appointment of Surgical Specialist, namely, in order of precedence, Captain S.

Ritson, F.R.C.S.; Captain S. Lyle; and Major R. H. Paramore, F.R.C.S. My warmest thanks are due to these officers for their never-failing skill, devotion, care and resource and for their accurate records from which brief notes have been compiled.

OBSERVATIONS ON MOSQUITOES AT SANDWICH DURING THE YEARS 1918-19.

By GEORGE TALBOT, F.E.S.

SYNOPSIS.

1.—Introduction.

Whilst engaged as laboratory assistant in the Royal Army Medical Corps, I was sent to Sandwich to help with the antimalarial work which was being carried on there. The War Office had established the nucleus of an entomological laboratory at Stonar Camp and some good practical work resulted. This has been described by the proper department, and much credit has devolved upon the officers concerned with the work.

A new and efficient laboratory has now been established where previously we had a small shed, sharing the work of the bacteriological section of the hospital. Thus we laboured under many difficulties as regards laboratory work, and I shall always remember the regulation stove, which served either to freeze or to scorch, and which deposited dust like a volcano.

2.—The Prevalence of Anopheles in the Military Area.

Since the main object of the antimalaria work was to clear the camp of anopheles, it was thought that some record should be made of the occurrence of adults after the summer. A thorough war had been waged against larvæ and pupæ in the waterways during the spring and summer of 1918. Previous to my taking up duty here, records had been made of the mosquitoes found in certain huts in each of the camps.

This did not appear to me to yield reliable results and I obtained the necessary sanction to make a detailed investigation. This work was carried on mostly during the month of December.

In December a number of men were selected from the antimalaria staff, and these were instructed how to catch the insects, where to look for them, and how

to distinguish *Anopheles*, *Theobaldia*, and *Culex*. These men worked through most of the buildings in the five camps, and entered their catches in a book. I examined each catch at the close of each inspection, and verified the notes made. The results are tabulated in the following table.

TABLE I.—RECORD OF MOSQUITOES CAPTURED IN THE DIFFERENT CAMPS OF THE SANDWICH MILITARY AREA DURING DECEMBER, 1918.

Camp	Number of buildings inspected	*Anopheles maculipennis*		*Theobaldia annulata*		*Culex pipiens*		Totals			Percentage of total number of buildings inspected	Percentage of total number of mosquitoes
		♂	♀	♂	♀	♂	♀	Anopheles ♀	Culicinæ ♂	Culicinæ ♀		
Cowan ..	110	—	2	2	6	—	1	2	2	7	16·5	6
Construction	52	—	—	2	—	—	1	—	2	1	8	1·5
Kitchener ..	252	—	—	7	10	—	11	—	7	21	38·5	15
Haig	111	—	—	—	1	—	2	—	—	3	17	1·5
Stonar ..	132	—	9	7	14	—	116	9	7	130	20	76
Totals ..	657	..	..	..	..	..	..	11	18	162	..	..

It will be seen from Table I that the percentage of buildings bears no relation to the percentage of mosquitoes in any one area. We find also that the insects were most numerous in Stonar Camp, occurring in decreasing numbers in Kitchener, Cowan, Construction, and Haig Camps, in the order given.

These facts may be explained by the existence of certain shelter and of water close to the camp. With the exception of Stonar, where many trees and bushes were distributed, the camps were in open country.

The proximity of numerous dykes was a feature of Stonar, Kitchener, and Construction Camps, and to a less extent of the other two where filling-in had been done. The entire area, with its eighteen miles of dykes, had received an equal share of treatment in each section, on the approved antimalaria lines, and we must look to the existence of water in conjunction with bushes and trees, and to the prevailing winds, to explain the distribution of the insects.

Stonar Camp or Depot, which was always most infected, lies to the south near Sandwich. It is bisected by a road running west to east, with the southern portion thus cut off, constituting the most infected part in any of the five camps. This section is nearest the meadows and numerous dykes. The many trees and bushes give shelter from the prevailing winds. Stonar Camp is bounded on the east by the River Stour, on the north by a large artificial lake, and on the west by the main Sandwich to Ramsgate road. [We were struck by the fact that in the southern and more heavily-infected zone, one of the antimalaria screened huts had been placed.]

Kitchener Camp represented the largest area of hutments. It was bounded on the west by meadows traversed by numerous dykes, and was exposed to all winds.

Cowan Camp was adjacent to Kitchener Camp on the north, and exposed to all winds. There were fewer dykes here.

Construction Camp was adjacent to Cowan Camp on the north, and exposed to all winds. There were more dykes in this area than in Cowan Camp.

Haig Camp was adjacent to Stonar Camp on the north, and was bounded by the lake on the east. There were few dykes here.

The lake was not a breeding place in 1918. It harboured no weed and was exposed, being frequently much agitated by the wind. It was also probably too deep to permit of larvæ developing properly under these conditions.

It was not found practicable to make a daily inspection in each of the five camps. The days spent in Kitchener Camp numbered 13, in Stonar Camp 11, in Haig Camp 7, in Construction Camp 6 and in Cowan Camp 5. The time spent in each area was therefore in some proportion to the number of buildings contained in it. The buildings inspected included living huts, store huts, Y.M.C.A. huts, canteens, bath houses and latrines.

Every female specimen taken in the camps was examined for signs of having fed, but in only one instance was this observed. A specimen of *Theobaldia annulata* was taken in a living hut on the morning of December 4, fully distended with blood. Many specimens of *Culex pipiens* were quite plump in the body and the gut contents were yellowish. No male of this species was found during December, and neither is there any record of a male Anopheles at this time.

The small number of Anopheles captured points to the success attending the treatment of the dykes during the spring and summer of 1918.

3.—The Occurrence of Mosquitoes in Conjunction with Meteorological Factors.

The occurrence of mosquitoes on each day of the month, in conjunction with meteorological factors, is shown on the accompanying chart. The chart indicates a certain increase in catches at the periods of marked rises in temperature.

The meteorological records were taken in a Stevenson screen, kindly lent by Dr. J. J. Day, O.B.E., of Sandwich. Observations were made at 8 a.m. daily.

4.—The Occurrence of Anopheles in Sandwich.

An inspection was made of the principal stables and cowsheds in the town of Sandwich, nineteen in all. *A. maculipennis* was sparsely distributed in the town itself. The most notorious habitat, a certain cowshed, was found to be the resort of but a few. This cowshed was reported to be greatly infested in September, 1917, and to a less extent in February and April, 1918. It was visited by us on January 5, 1919.

Large and airy stables were freer from Anopheles than smaller and warmer ones. Where lofts existed above the stables it was there that most individuals were found.

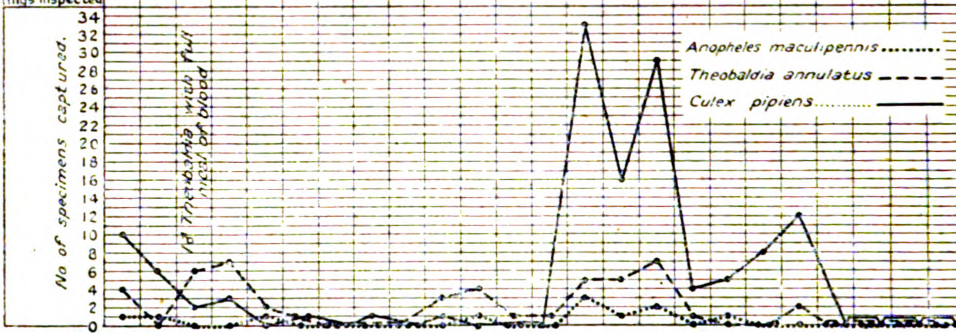
A farm on the Sandwich Bay road, known as Hooker's Farm, was found to be the resort of large numbers of *A. maculipennis*. They congregated in a small and warm stable where two horses were usually kept. The mosquitoes clung to the cobwebs which covered the rafters. A few *C. pipiens* and *T. annulata* were also found in this stable. A certain number of the Anopheles were found to have fed, about eighteen per cent of those captured on each occasion.

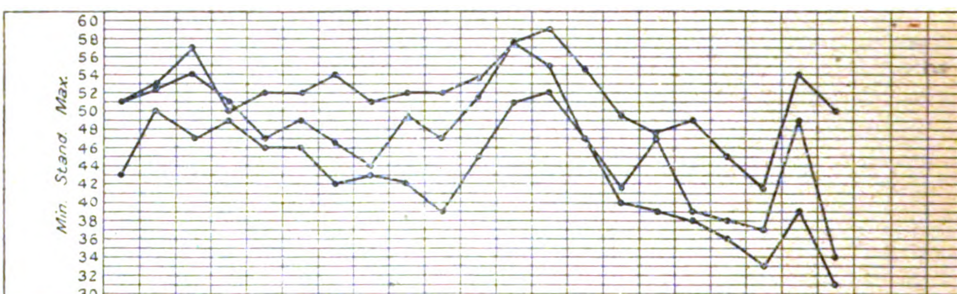
In the town only one recently-fed anopheles was taken during the search. It

cannot be said with any certainty that these mosquitoes were hibernating. Hibernation may occur when the conditions are cool enough and in the absence of suitable hosts.

Record of the Occurrence of Mosquitoes in the Military Area of Sandwich during December, 1918.

Day of Month	2	3	4	5	6	7	8	9	10	11	12	13	14	16	17	18	19	20	21	23	24	27	28	30
No of Buildings inspected	25	30	42	45	24	24	0	51	41	23	34	41	41	37	26	24	16	8	15	17	23	20	15	24





Dry bulb	51°	53°	54°	51°	47·5	49°	47°	44°	49·5	47·5	52°	57·5	55°	47°	42°	47°	39°	37°	37°	49°	35°		
Wet bulb	50°	52°	54°	49°	47°	48°	46°	43°	48·5	48°	51°	56°	54°	45°	40°	46°	36·5	35°	36°	46°	34°		
Wind	S.W.	S.W.	S.W.	S.W.	S.	W.	S.E.	S.W.	S.	S.	S.W.	S.W.	S.W.	S.W.	N.W.	S.W.		N.W.	N.W.	W.	W.		

5.—The Occurrence of the Larvæ of Anopheles and Culicines from October to January.

The larvæ of *A. maculipennis* and *bifurcatus* were to be found during October in Hooker's Dyke on the Sandwich Bay road about half a mile from the town. Larvæ taken later could not be brought to the adult stage, and it was not possible to differentiate the two species among those collected from November to January.

October 14.—Larvæ very common in the dyke.

October 18—Larvæ scarcer, perhaps owing to the area having been cleared of weed, and the pipe connected with an adjacent dyke cleaned out. Larvæ and pupæ were found along the margin on the side bordered by a hedge.

October 22.—No larvæ were found in the dyke. A search was made in a lane near by. The ditch on each side was choked with sedge and reed, but was found

to harbour many larvæ of Anopheles, especially on the east side. A larva taken this day pupated on November 13, and emerged as a female *A. maculipennis* on November 24.

November 26.—About 100 anopheline larvæ were obtained in the lane. They appeared to be in the second and third instars, but some of the former had hardly developed since the first ecdysis. Some in the third instar were well developed and near the period of ecdysis.

January 14.—Larvæ scarcer in the lane. Those obtained were found near the bank. Some mud from the bottom was examined with negative results. The bottom was well stirred up but no more larvæ were to be found.

No anopheline larvæ were found in the military area during the period. The nearest habitat was a dyke about half a mile west of Kitchener Camp, beyond what is known as the Monk's Wall. One female of *A. bifurcatus* emerged from larvæ obtained here on October 23. The only culicines noticed were *T. annulata* and *C. pipiens*. Larvæ of both were found in the above dyke on October 23. A second visit paid here on November 22 was unproductive, the only find being one dead pupa of *C. pipiens*. At the northern end of the area was a small ditch running behind the "Red Lion" public house. Larvæ and pupæ of *Theobaldia* and of *C. pipiens* were common here on October 30.

6.—Hibernation of Larvæ.

Anopheline larvæ, presumably of *bifurcatus*, were found in January. Larvæ taken in October and November, and kept in jars in the laboratory, did not appear to undergo any development. During December and January not more than three cast skins were found.

The larvæ were kept in dyke water in jars on a window shelf. They were constantly feeding, and under the microscope defæcation was observed. All these larvæ, however, differed from those in active growth by the absence of food in the thoracic cæca. It seems that food is taken in and passed directly to the gut where it is probably digested very slowly.

A larva placed in tap water on December 11 remained active, and was transferred to distilled water on January 16. It lived until January 31, and the gut contents showed no apparent sign of diminution at the close. The gut contents was probably food debris. The tap-water used was the ordinary camp supply, and was very hard in character.

The larvæ were seen to be in a state of true hibernation, and we obtained no evidence that they remained on the bottom or entered the mud. Perhaps with a prolonged period of severe weather hibernation may take place.

7.—Resistance of Larvæ and Adults to Frost.

During February some low temperatures were recorded, with as much as twelve degrees of frost in the screen. The jars containing larvæ in the laboratory were frozen on four nights. Ice formed around and above, a certain amount of water being left in the centre where the larvæ could be seen moving about. Some were caught on the surface and frozen in the ice; these did not always survive. Altogether very few larvæ died.

The jars buried in the ground outside were of course frozen more solidly, and had cracked. The smaller jar had lost most of its water, which had escaped

through a fracturė of the glass, a layer of ice at the top alone remaining. The bottom of this came off and the mud was washed from it under the tap; three larvæ were recovered and found to be alive.

The cage in the laboratory containing about sixty adult Anopheles was exposed to the severe cold at night, but no more than a dozen deaths were recorded. During the day these insects were exposed to a warm atmosphere owing to the stove being used.

The lowest temperatures recorded were on February 11, 20° F.; 12th, 19° F.; 5th, 23° F.; 9th, 24° F.; 10th, 28° F. I take this opportunity of recording the following from the laboratory notebook. This note was made by Serjt. Hill, of the Sanitary Section, Richborough, on December 29, 1917:—

"A mosquito pupa and one larva taken from the dyke at the roadside near "Red Lion" on November 30, 1917, had lived through several hard frosts with water in a sample bottle frozen over. They showed no inclination to bury themselves in the mud, but were very sluggish in movement, and had not changed their stage on December 29, 1917 (twenty-nine days). Frozen solid January 10-11, 1918. Dead after thaw."

8.—Hibernation of Adults.

We could obtain no conclusive evidence that *A. maculipennis* hibernated during the winter in the adult stage. It is possible that individuals may hibernate where the shelter is cold and no opportunity for feeding can occur. Specimens taken from stables in Sandwich town were quite active, and in one case an individual had recently fed. Those inhabiting the stable at Hooker's Farm were certainly not hibernating. An experiment was tried here with a view to ascertaining for how long the insects would go without food. One hundred and fifty *A. maculipennis* (females) were collected in the stable and placed in a Lepidoptera breeding-cage on a shelf in the stable.

On December 13, fifty females were taken and transferred to the cage. Of these eighteen per cent had fed recently, and most of the others showed signs of having fed a day or two before.

On December 14 fifty more females were added to the cage. Of these twenty per cent had fed recently. On December 18 fifty more females were added. Of these twenty per cent had fed recently and eighteen per cent some time previous. In these latter specimens the abdomen appeared to be distended with partly digested blood, which was not bright red as in the more recently fed individuals. We note, therefore, that only thirty-eight per cent had fed during the preceding forty-eight hours or so. Where the abdomen was but slightly distended the lateral sclerites were clear and showed no dark coloration within. Others, which apparently had not fed for a long time, showed no sign of abdominal distension, the abdomen in these individuals being no larger than in newly-hatched specimens. No deaths were observed among the 100 individuals taken on the 13th and 14th.

January 13.—The cage was found to contain dead specimens to the number of 118, which left thirty-two living. Out of the total number of 150 there were twenty-nine which, at the time of capture, had fed recently. We may, perhaps, conclude that these were to be numbered among the survivors. It is probable that a recently-fed mosquito would survive longer than one which had not fed for some time, but this may still require confirmation by experiment. Most of

these individuals were probably fertilized, as was the case with some I dissected, and in this event a continuous supply of food would tend to more early development of eggs (and a vitalizing of the organism, rendering it less able to withstand hunger).

On December 13 thirty-six Anopheles were taken in the stable and seven of these had fed recently.

Some cold weather was experienced at the latter part of December and beginning of January, the lowest recorded minimum being 27° F. on December 25. Specimens kept in the laboratory cage during this time remained alive, though the room must have been very cold at night. Honey and water were supplied to these but very rarely were any observed to feed.

We had no further opportunity of repeating the hibernation experiment, as more cages were necessary for a proper test under different conditions, and these cages were not forthcoming.

9.—The Clypeal Hairs of Anopheles Larvæ.

Grassi was the first to study the clypeal hairs and to point out that they were of specific importance in some species. He was able to identify the larvæ of *A. maculipennis* and *bifurcatus* by the differences in structure presented by their clypeal hairs. Very few observations have been made by later workers, and apparently it is still uncertain whether the larvæ of the two species above noted can be distinguished in every stage by the clypeal hairs. It seems also uncertain whether all *A. maculipennis* larvæ in the fourth instar always have the outer pair of hairs dendroid, and whether in *A. bifurcatus* the hairs are always unbranched.

With the object of throwing some further light on this question, I made an examination of about 200 larvæ. All these would be probably *bifurcatus* according to present knowledge, as they were obtained between the end of September, 1918, and middle of January, 1919.

None of these larvæ presented typical dendroid hairs such as were observed in mounted specimens of *A. maculipennis* obtained in August. Whilst perhaps not more than fifty per cent of the larvæ had simple hairs, the remainder exhibited much variation in branching.

The following variations were to be distinguished:—

(A) *Larvæ taken at Hooker's Dyke, half a mile from Sandwich, on the Sandwich Bay Road.*

(1) All simple.
(2) All branched.
(3) Lateral pair 2-branched, middle pair simple.
(4) Left lateral hair 2-branched, others simple.
(5) Left lateral hair 3-branched, others simple.
(6) Right lateral hair 2-branched, others simple.
(7) Right lateral hair 3-branched, others simple.
(8) Right lateral hair 4-branched, right lateral 2-branched, middle pair simple.
(9) Right lateral hair 3-branched, left lateral forked at tip, middle pair simple.
(10) Right middle hair 2-branched, others simple.
(11) Middle pair branched, lateral pair simple.

(12) Right middle hair 3-branched, others simple.

(13) Middle pair 3-branched, lateral pair absent.

(14) Left lateral and middle pair 2-branched, other simple.

(15) Right lateral and middle pair 2-branched, other simple.

(16) Left lateral and left middle 3-branched, right lateral simple, right middle 2-branched.

(17) Left lateral simple, others 2-branched.

(18) Right lateral simple, others branched.

(19) Lateral hairs 2-branched, middle pair 3-branched.

(20) Left lateral 3-branched, right 4-branched, left middle 2-branched, right simple.

(21) Left lateral 2-branched, right 3-branched, left middle 3-branched, right simple.

(22) Left lateral 2-branched, right 3-branched, left middle 2-branched, right simple.

(23) Left lateral 3-branched, right 2-branched, right middle 4-branched, left simple.

(24) Lateral hairs 3-branched, right middle 4-branched, left middle 5-branched.

(25) Right middle hair simple, others 2-branched.

(26) Left middle hair 2-branched, others 3-branched.

(27) Right lateral absent, others simple (one specimen).

(28) Left lateral absent, others simple (one specimen).

(29) Middle pair absent, right lateral 3-branched, left 2-branched (one specimen).

(B) *Larvæ taken at Sheppey.*

(30) Laterals and right middle 2-branched, others simple.

(31) Left lateral 3-branched, right simple, middle pair forked at tip.

(32) Left lateral forked at tip, left middle 2-branched, others simple.

(33) Left middle 2-branched, others simple. Also variations 1, 2, 4, 6, 8, and 10.

The two posterior clypeal hairs were observed in a number of cases. These were found to be mostly 2-branched, but were frequently 3-branched.

10.—Feeding Experiments with *Anopheles maculipennis.*

A large cage in the laboratory contained numerous females captured on November 25 and 27. These were supplied with honey and water.

(1) December 6.—Arm inserted for ten or fifteen minutes. None settled.

(2) December 10.—Cage containing forty-seven insects. Arm inserted for ten minutes in morning. None settled. At 4 p.m. the insects became lively and the arm was inserted for twenty minutes. Three bites were recorded but only two took their fill.

(3) December 11.—Would not feed.

(4) December 12.—Would not feed.

(5) December 13.—One fed.

(6) December 17.—Fifty-four females in the cage. Would not feed.

(7) January 3.—Arm exposed for five minutes. Five individuals settled on it at different times; one bit on hand but did not take a full meal; the others settled on arm and made unsuccessful attempts to suck and then flew off.

The failure of these trials was probably due to the absence of the necessary warmth and humidity.

11.—Latest Records of Adults and Larvæ.

Anopheles maculipennis.—Larva: October 22, pupated November 13; Male: October 10, 1917; Female: Throughout the winter.

Anopheles bifurcatus.—Larva: Throughout the winter; Pupa: October 23; Adults: None seen between October and January.

Theobaldia annulata.—Larva: October 23, pupated November 13; Adults, male and female: Through the winter.

Culex pipiens.—Pupation: November 20; Male: November 11, 1917; Female: Through the winter.

12.—Note on Early Egg Development in *Theobaldia annulata.*

A female of this species was taken in Hooker's stable on December 18. It was dissected by me and found to have developed an egg mass. The eggs were white and opaque. Examined with $\frac{1}{6}$-inch objective, an oval and densely granular mass was seen surrounded by a thin transparent envelope externally thickened. At the micropylar end was a transparent area containing numbers of globules. The gut contained a small quantity of digested blood.

Lecture.

PHYSICAL TRAINING.

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If the phrase "survival of the fittest" be applicable in a wide and general fashion, it might with all propriety be applied to the subject of physical training. Surely no subject has suffered so severely at the hands of its devotees. Its survival of its many ordeals speaks volumes for the fundamental truths and values it represents. As a recognized item in the development of the people, in this country at least, it has spent a most unhappy and precarious childhood, the beloved child of the fanatic, the toy of the up-to-date educationist and the sport of the charlatan. The ideas or doctrines which have been held at one time or the other about it have been many and varied, and speaking generally, the main aspect—the physiological one—has been badly treated. Physiology has been Cinderella in the pre-princess period and the violation of physiological principles apparently the main object of those who had to deal with the subject. It is a sad history but the truth is now dawning upon those in high places. The Army Gymnastic Staff have played a very important and very enlightened part in the later development and, in my opinion, have evolved a system which, for soundness and efficiency, would be difficult to beat. The reading of the various manuals issued by them and the practical work I had the good fortune to see and study closely in the various training camps during the last two years of the war

have convinced me of the broad-mindedness and sanity of the system. The definitions of the object and scope of physical exercises could hardly be bettered, pointing out as they do that the main object of the training is the production of the physically and *mentally* fit soldier, the man who is fitted to meet and cope with the innumerable and ever-changing demands of war. Their justification for physical training being the foundation for all trainings is admirable in its brevity. The benefits derived from physical training are:—

(*a*) Strengthening of the body, power to overcome obstacles and perform arduous duties.

(*b*) Improvement and maintenance of health, endurance of hardships and privations.

(*c*) Quickening of the brain, more rapid assimilation of instruction in other trainings, orders readily understood and rapidly executed.

(*d*) Increase of power of mental concentration, the foundation of good shooting.

Such then is the nature and spirit of the training in our Army. It is so good both in spirit and in action that I almost fear for its future. It has achieved much—the keenness, enthusiasm, and good sense of the skilled instructors was stimulating to watch—and it can achieve more. They must not forget that the fatal and insidious malady of self-satisfaction is an endemic disease; that habit and routine is the grave of all effort.

The Army is in a peculiar position, indeed it holds a unique position, in the community. Its material—men, taken relatively young for the most part, enlisted for varying periods, and at the end, the great majority, returned to civilian life. The Army, then, has two definite duties towards the community, it has got to train men for highly specialized and definite although limited work which demands, both in peace and in war, the best physical and mental development, and it has to return fit men to civilian life. The great asset of army training is that it requires more than merely to make any individual soldier a well-nigh perfect machine in the performance of some minute technical operation. It is this dual development of the physical and psychical aspects of the individual which gives the army training its main value. The soldier must not only be able to march, to dig, to shoot, but he must have morale. The fight is not merely won by the bull-dog sticking capacity we so often pride ourselves upon. Although "sticking it out" may and does play a very large part, it, of itself, will not win the fight. The other side may also be dogged. It is doggedness combined with will-power and the power to grasp and appreciate a situation rapidly which leads to victory. Our system has been tested in the fiery furnace of war and it has stood the test.

What of the material which joins the Army for training? No words suffice to describe the magnificent effort our Army, officers and men alike, made in the war. It could not have been bettered. This effort was not confined to the A 1 groups, the front line soldiers. The lower categories on all fronts played their parts nobly, indeed perhaps more nobly than the absolutely fit A 1 men, in that they had to struggle against incapacities of varying degrees of severity.

Most of us, if we had been asked in 1914 about the physical fitness of the nation, would have resented the imputation that we had a C3 (if the term had then been in existence) population. We were complacent and happy about the

physique of the people. The skeleton in the national cupboard lay unsuspected. The war tore away the bandage from our eyes. Many of us heard rumours, and some of us had seen for ourselves, the actual conditions. Now it is public property. The volume recently published by the Ministry of National Service completes our discomfiture. It is terrible and heartbreaking. The following excerpts give a just idea of the grim story.

"War is a stern taskmaster. . . . It has compelled us to take stock of the health and physique of our manhood; this stocktaking has brought us face to face with ugly facts and—one hopes—awoke us from the half-hearted complacency with which in the past we have treated one most important national asset, the health of the nation."

Think of it, if Keith's figures be taken as a correct estimate, that in this country in place of 70 per cent Grade I, there is only 35·9 per cent; of Grade II, 22·6 per cent instead of 20 per cent; of Grade III, 31·2 per cent instead of 7·5 per cent, and of Grade IV, 10·3 per cent instead of 2·5 per cent. In other words :—

"Medical examination showed that of every nine men of military age, in Great Britain, on the average three were perfectly fit and healthy; two were upon a definite infirm plane of health and strength, whether from some disability or some failure in development; three were incapable of undergoing more than a very moderate degree of physical exertion and could almost (in view of their age) be described with justice as physical wrecks, and the remaining man as a chronic invalid with a precarious hold upon life."

"*It seems probable that the men examined during the year under review may be regarded in the aggregate as fairly representing the manhood of military age of the country in the early part of the twentieth century, from the standpoint of health and physique, and the deductions founded upon the observations made at the medical examination of these men may legitimately be looked upon as a trustworthy criterion of the national health of this period.*"

Such then is the material the Army has to draw upon for training purposes and most often it does not get the pick.

It is essential then that the physical training should be the best and the finest available. The fact to be faced at the outset is that we have to deal with the unfit but probably physiologically sound organism, the recruiting medical officer having weeded out the physiologically unsound.

What of the actual physiological facts of physical training? Muscle action has become to most of us such an ordinary daily performance that its complexity is almost completely ignored and even, in the case of the many who are interested, directly or indirectly, in the performance of special forms of muscular exercise, like the clinician in cardiac disease, the employer and employee in industrial fatigue, the rich and poor alike in sport and the educational enthusiast in development pure and simple, there is but little sound knowledge of the far-reaching physiological effects of exercise and training, of the varying factors which influence the efficiency of the body and the varying results which arise from muscle activity.

The body is the perfect communal state where each unit freely contributes its best where there is a perfect mobilization of available resources to meet immediate

demands. There is perfect co-ordination up to the final effort when all the reserves are mobilized.

In the physiological consideration of muscular exercise we cannot confine ourselves merely to the tissues which superficially appear to be the chief actors—the muscles. No doubt the muscles are important, they are the effectors, the transformers of the potential energy of the food-stuffs into the free energy required for the performance of external muscular work; but, unless the other tissues and organs co-operate in this activity, the body would soon suffer in efficiency.

It is not necessary to consider here the very complicated physiological processes which underlie the actual liberation of energy in the muscle. Two facts emerge, however, which are of paramount importance, namely: (1) The animal body is a most efficient transformer of energy. If a rough average for daily work be taken, the efficiency is found to lie between 20 per cent and 25 per cent, and under special conditions it can probably rise well above 30 per cent; (2) the animal body is capable either of a long-continued output of energy, eight or nine times above the basal level or of short bursts, twelve or fifteen, or even more times above this level.

Nor do we require to enter into any great detail as to the mode of combustion of the foodstuff consumed, nor of the actual requirements of food, beyond emphasizing the point that modern research simply reiterates and confirms the statement that for the production of energy, during muscular activity, the foodstuff par excellence is carbohydrate. The old belief, on the other hand, that for the efficient production of work protein in large quantities is required is not strictly true. It is essential to have clear ideas upon this point. It does not suffice, simply because the point cannot be proved experimentally in the laboratory, to dismiss as old wives' tales the traditional experience of a large number of scientifically ignorant but highly skilled trainers of men for all varieties of athletic contests. Their story is almost invariably: give meat and more meat, i.e., protein and more protein. How are the scientific observations, that the body burns during work and demands during the performance of hard muscular work, carbohydrate, and that there is little or no increase in the output of the nitrogen following work, providing the diet is adequate, to be squared with these traditional beliefs of the trainers? There must be some explanation. We must in the first place glance at the question of protein storage. Experimental work has definitely shown that this is carried on at a very low level except under, so far as I know, two well defined conditions: (1) Recovery after a wasting disease, typhoid, for example; (2) when, coincident with the ingestion of large quantities of protein, hard muscular work is engaged in. A good deal of experimental work has been done on the first of these conditions but very little on the second. We also know that the improvement in muscle condition following continuous and graded exercise is not associated with any marked increase in the cellular elements of the muscle; that the increase in bulk is for the most part due simply to the swelling out of already existent cells—the so-called eutrophy. Further we know that the ingestion of protein is accompanied by a curious and most interesting physiological condition known as specific dynamic action, i.e., the ingestion of protein (to a smaller degree fats and carbohydrates have the same power), leads to a definite increase in tissue metabolism, an increased production of heat. (This increase is almost certainly not available for the performance of work, but under certain

conditions, the conditions experienced for example in the front line for the most part in France during the war, this extra production of heat is useful.) Again we know that if it is desirable to get the optimum condition for bringing about the storage of protein material in the tissues, the diet to be avoided, the diet which offers the greatest difficulty, is one which consists exclusively of, or is particularly rich in, protein, presumably on account of the specific dynamic action just referred to. On these grounds then, the free use of protein in a training dietary should prima facie be bad. But is it? Rubner has, in my opinion, laid stress on a point which has been rather overlooked, namely that there is in all probability an optimum concentration of protein in the living cell. He has suggested that a moiety of the ingested protein which he called the melioration protein is utilized for the improvement of the condition of the cell. The obvious difficulty is, even supposing there is a special assimilation of protein up to the optimum, or even maximum concentration, that all value would be lost by the extra metabolism induced by the specific dynamic action. But both Rubner and Lusk have shown that the protein which is stored, or to be more accurate, that moiety of the ingested protein which is utilized to cover the wear and tear, does not exert any specific dynamic action and presumably, therefore, when the conditions are favourable, all melioration protein is taken up, without increased metabolism. But under the special methods of feeding adopted the amount of ingested protein far exceeds the amount required either for wear and tear or melioration. The excess protein undoubtedly would exert its characteristic specific dynamic action. The increased metabolism may be held, in turn, to produce more active changes in the active metabolic cells and lead to a more complete and perfect use of available material, than is normally the case, indeed, Voit and later Lusk, have shown that there is an actual chemical stimulation of the cells which causes them to metabolize more material, just as in an active and alive business when trade is booming there is a more rapid and thorough turnover of the articles of trade, no stock is allowed to deteriorate by being stored for too long a period, and any material which does show signs of deterioration is disposed of at once as ample fresh supplies are immediately available. The fact that the basal metabolism of athletes is a little higher than that of untrained men shows, assuming that there is no increase in cellular elements, that there can be an actual increase in the metabolic activity of the cell. A case, therefore, can be made out for the high protein consumption during training, but why in practice is this confined so exclusively to protein of animal origin? Again, a reasonable explanation may be offered. It is well known that proteins are not all of equal value to the organism, indeed some are so imperfect that they are of little or no value. Examination of these various types of protein has shown that speaking generally the perfect types are mostly of animal origin, and the less perfect mostly of vegetable origin. Another grave objection to the proteins of vegetable origin is that if it be desired to consume them in any quantity, in their natural form, the bulk of the diet is raised to almost unwieldy proportions, as the content of the majority of vegetables or cereals in protein is low.

We must now turn to the consideration of the part played by the other organs of the body in assisting or controlling the expenditure of energy. Two things are absolutely essential, a sufficient supply of oxygen and an efficient circulation. Because we see the powerful skeletal muscles performing the various movements

required, the tendency has been to concentrate attention upon them. Every type of training experience, however, has definitely led to one conclusion, namely, that it is on the heart that the stress of exercise falls most heavily. This is not confined merely to the uncomplicated training for sporting events, in the calm and peace of the gymnasium. Maitland has for instance shown that in the case of soldiers in the field, the stress of the conditions of war most frequently leads to cardiac trouble, associated with disturbances both of the pulse and blood pressure. Bainbridge has summed the matter up very shortly, and to the point, in his statement that, "a man reaches the limit of his working powers as soon as the output of his heart fails to correspond with the demands of the tissues for oxygen."

The demand for oxygen and the cardiac activity are very intimately related; indeed, the output of the heart per unit of time has been shown to run almost parallel with the consumption of oxygen, and therefore to all intents and purposes with the amount of external work performed, as the rise in the consumption of oxygen is mainly governed by the mass of active metabolic muscle tissue. It is evident, then, that the regulation of the output of the heart must be an important feature in muscular activity. This regulation is normally effected by having a larger output per beat, and in all probability to a greater extent by an acceleration of the pulse-rate. As a result of the various changes in pressure which take place, it has got, for example, to contend against a markedly increased venous inflow, the heart under perfectly normal conditions dilates. Dilatation of the heart during exercise is to be looked upon, therefore, as a physiological process, which is essential in accordance with the "law of the heart" (the force with which the heart contracts during systole varies directly with the volume of the heart at the end of diastole) enunciated by Starling, so that a larger output per beat may balance the large increase in venous inflow.

The dilatation is probably kept within moderate limits by the acceleration in the pulse-rate which takes place. The pulse-rate itself, as Benedict constantly maintains, is a very good index of the metabolism, and therefore of the intensity of the muscle work performed. But, apart from this general statement, it is found varying, perhaps, for each individual, that there is a close correspondence between the pulse-rate and the work done. It is also found that as a general rule the pulse-rate is definitely lower in the trained than in the untrained man—a fact which may in part, at least, be explained on the ground that the contractile power of the heart of the untrained man is less, and this deficiency has to be made good, in order to cope with the conditions, by acceleration of the pulse-rate.

There is absolutely no evidence that the healthy individual is injured in any way by hard muscular work, no matter how severe, provided the man sets his own pace. The only danger with the moderately healthy man is when he is not allowed to gauge his own capacity for work, but is driven at a wrong pace, and for too long a period by some soulless pace-maker, machine or man. When the untrained or only partially trained man is called upon to exert himself beyond his powers, the heart may be seriously affected. This result used to be so common amongst soldiers, as the result of improper demands on their physique, that it went by the name of "soldier's heart," for which nowadays the term "effort syndrome" has been substituted. This condition of soldier's heart was associated with a more or less regular train of symptoms, the more marked of which are lessened ability for performance of work and a hypersensitiveness of

the circulatory and respiratory systems to the stimulus of exercise. As the condition is found in all grades of severity, in addition to the above two main symptoms, all varieties of cardiac exhaustion and conditions arising therefrom are found, lowered contractile power of the heart, oxygen shortage, &c. Whatever the chief ætiological factor in this condition may be, there seems to be no doubt that there are definite disturbances in the metabolism of the cardiac musculature.

Closely associated with the condition of the heart, as it controls the porterage, is the supply of oxygen to the tissues. It may be well to be perfectly explicit here, and to state that the great attention which is devoted by a certain section of physical training enthusiasts to the subject of deep breathing and chest expansion is largely a case of "love's labours lost." The ideas are wrong in the main, and even dangerous in practice. As Pembrey has stated, "The body is a living organism, not a blast furnace; it does not take up more oxygen than it requires, however much the lungs are ventilated, and if too much carbon dioxide be removed, the subject becomes giddy and stops breathing." It is perfectly true, however, that during muscle exercise there are greater demands for oxygen by the muscle, and the amount demanded varies practically directly with the amount of external work done. Under normal conditions this increased demand for oxygen is met by an increased ventilation of the lungs, which in turn is brought about, probably in the first place through a nervous mechanism, as the increased ventilation starts before the second, and perhaps the main stimulus to increased ventilation becomes operative—namely, the rise in the hydrogen ion concentration (carbonic and lactic acids) of the blood. So far as our information goes at present, there is absolutely no indication that the respiratory mechanism ever fails in the normal individual to supply an adequate amount of oxygen to meet the needs of the organism. As the question of the oxygen supply is solely a matter of the saturation of the oxyhæmoglobin passing through the lungs with oxygen, the rate of the blood flow through the lungs must vary with the pulmonary ventilation; hence the necessity of perfect co-ordination between the heart and the lungs.

As regards the transference of oxygen in turn from the blood to the muscle tissues, it has been shown that during exercise the muscle can take up from each fraction of the blood flowing through it at least double the amount consumed during the resting condition. It must also be remembered that, in addition, the flow of blood through the active muscles, in part due to increased pulse-rate, in part due to additional blood channels being opened up in active muscles (Krogh), is markedly increased. As a result, therefore, normally, during exercise the actual amount of oxygen taken up may be ten or fifteen, or even more times that consumed during rest. The speed with which the oxyhæmoglobin is dissociated during exercise is assisted by two conditions common to muscular activity, the tendency to increase in the hydrogen ion concentration of the blood and the rise of temperature. These factors have little or no effect on the taking up of oxygen in the lungs, as the tension of oxygen in the alveoli is high and the circulation rate in the lungs is slower than that in the muscle.

Training, then, in reality only consists of two things, the gradual development of the muscles and the co-ordination of the heart and lungs, so that the supply of oxygen to the tissues under all conditions of expenditure will be adequate. As the increase of the skeletal muscle is associated with a concomitant increase in

cardiac muscle, the enlarged heart of athletes is a perfectly physiological phenomenon. Perhaps more interesting is the fact that with training there is usually a progressive fall in the pulse-rate, and in many of the best trained athletes the rate would generally be considered to be abnormally low. But even more important from every point of view is the fact that training properly carried out leads to more perfect co-ordination and increased economy of movement. It is the ill-trained man who finds exercise fatiguing, as, in his efforts to keep up with the set rhythm, he expends an abnormally large amount of energy, instead of having, in such a comparatively simple position as standing at attention, his muscles equipoised, and, more or less at rest, he has them in a state of extreme tension. And, finally, whatever second wind may be, although the untrained man may get it, it seems to come more naturally to the man in thorough training.

Lastly, there is the question of fatigue. Here the psychic factor enters very largely, for although, generally speaking, the sense of fatigue, i.e., the subjective feeling and the failing capacity to perform muscle work agree fairly well in the normal subject, it must not be forgotten that in many apparently normal men their sense of fatigue is but a fallacious guide. We all recognize variations in temperament; as it has been put, "a man is not always as tired as he feels, and an almost normal capacity for work may co-exist with marked subjective fatigue" (Bainbridge). It is this psychic factor which is so often overlooked. Because a certain exercise is believed to be good it is no use enforcing it unless it can be done with satisfaction, comfort and conviction. The whole secret of success in training lies in the instructor; he and he alone can get the best or the worst out of any series of exercise, he can arouse interest and enthusiasm or develop disgust and lethargy. A relatively poor system with a keen instructor will achieve more than the most ideal system and an indifferent instructor. The secret lies in the measurement of the doses, variety is the spice which lends flavour to routine, which lends zest to the performance of the regular round and directly helps towards the attainment of physical fitness. It is the psychology of physical training which requires attention and development. Unless the interest of the subjects under instruction is maintained the progress will be slow. On the other hand, this self-same enthusiasm must be kept firmly in hand lest the ill-developed physique be overstrained—the average man not the expert should set the pace. The central nervous system plays a very large part in the onset of fatigue. The fact is perhaps not so evident under the conditions of ordinary physical training, but one of the most interesting developments of the recent investigations into the causes of industrial fatigue is the determination of the tremendous part the brain plays. Many factors play a part in this: uninteresting work, endless routine, rate at which the work is performed, amount of time spent in the performance of the work. On the other hand, the actual local effects of the work in the muscles themselves must not be lost sight of. Fatigue may be cumulative, i.e., the work performed may be carried out so continuously that the muscle in the intervals of rest has no time for recuperation. It is for this reason that practice is so essential, but it must be practice of the muscles which are going to be used. No doubt the squad of men who are skilled in physical training are all-round better men than the less well trained, but mere physical training in the ordinary sense of the term cannot for instance take the place of actual practice in route marching.

Apart from the subjective feeling of fatigue, the central nervous system plays also an important part in physical training in bringing about the perfect co-ordination of the various organs which allows of the maximum effort being made with the minimum waste of energy. This is effected not only through impulses to the big medullary centres but also by stimulation through the sympathetic fibres. There is a reciprocal relation between the brain and muscles. The central nervous system can be, and very often is, saved from disaster by muscular action—how often are we saved from a verbal cataclysm by some convulsive muscular movement!

In the Army the attention need not be confined to the adult alone. In each large centre there are many children who can receive attention where the results accruing would be of immense value to the community. If physical training is of value to the youth who has almost finished growing, sane training under the conditions of modern life is of inestimable value to the young. We must build up an A1 nation, we cannot afford to perpetuate the horrors of the past. Remember we are working with inferior material, largely the progeny of the lower category men who have survived because the majority were not even good enough to be "cannon fodder." It is an ironic comment on the survival of the fittest. Pembrey was not far from the truth when he wrote "modern civilization has been maintained by a constant struggle against physiological principles. The results have been wonderful, but it cannot be said that they have produced satisfaction and contentment among mankind."

Reviews.

X-RAY OBSERVATIONS FOR FOREIGN BODIES AND THEIR LOCALIZATION. By Harold Gage, A.R.C., O.I.P.

This little book is evidently inspired by war work but much that is contained in it will be useful in civil practice.

The author has evidently had great experience of this branch of X-ray work. Many of the methods are ingenious and all make for accuracy.

The use of the cross section atlas of anatomy as recommended in one of the methods is worthy of high commendation. Considerable use of this method was made at one of the bases in France and was found to be most valuable.

While admitting the importance of the "central ray" in all localization work, there are simpler methods than those described which are just as accurate.

While some screen work is necessary for any localization there is no doubt that even when precautions are taken the operator runs the serious risk of burns if he has much of the work to do. In this little book much of the work is done by screen methods which are certainly more economical but in my experience not very much quicker. Unless stereoscopic pairs are taken the surgeon is deprived of the opportunity of making his own deductions as to the situation of the foreign body and I do not consider that any surgeon should attempt to remove a foreign body without having first consulted a stereoscopic pair of plates.

Working in a large base hospital with a specially skilled radiologist, I found

that the success of the various surgeons in removing foreign bodies depended entirely on their power of appreciating stereoscopic results.

As regards the author's advocacy of bromide paper, this is a little out of date as we have now the radioprint paper which is almost as quick as X-ray plates.

The little book shows much thoughtful work and should prove very valuable to X-ray workers.

It is well written and illustrated and remarkably free from errors in the letterpress.

THE HOUSE FLY. By Major E. E. Austen, D.S.O. British Museum (Natural History) Economic Series. No. 1A. Price 1s. 6d. net.

This small handbook deals with the house fly from an elementary and practical point of view; the name of the author is sufficient guarantee of its quality. The subject is considered from four aspects: (1) The recognition of the house fly; (2) the life history; (3) the diseases spread by the fly; (4) methods of control.

The last section presents an admirable summary on the anti-fly measures adopted on various fronts during the late war.

The "deep pit fly-proof" latrine is emphatically condemned, and this will be endorsed by many; but it is well to remember that under certain conditions, and with due precautions, these latrines were used with great success and overcame a difficulty which seemed almost insuperable.

No mention is made with regard to the attraction of light for flies and the bearing of this phenomenon upon the construction of traps and the planning and orientation of latrines and cook-houses. The point is an important one and might with benefit have been included.

The book is short and easy to read, and may with advantage be studied by all who are interested in the prevention of disease.

An excellent index, which is practically a summary of the subject matter, is included.

S. H. D.

"DIATHERMY IN MEDICAL AND SURGICAL PRACTICE." By Claude Saberton, M.D. Edited by Cassell and Co., Ltd., 1920. Pp. 138.

The aim of the little book, as stated in the preface, is to serve as a guide to students and practitioners who wish to master the technique of diathermy, and to appraise its plan in the treatment of disease.

With regard to the technique of applying this form of electricity, the manual sets out clearly the methods of production and use, etc., of high-frequency currents. The description of apparatus is clear and the diagrams and plates good.

It provides for the student or practitioner, who has already acquired a knowledge of general electricity, all he will need to enable him to use a high-frequency apparatus, and there are many useful hints to avoid untoward results.

When we come to the question of the treatment of disease, the book is not so convincing.

The author is too honest to make his book dogmatic enough to be useful to a student, and for the practitioner the impression gained is that the method has only a very limited utility, and even then only when combined with other methods.

Surgically its use is amply proven and has stood the test of time. For the treatment of papillomata of the bladder it is one of the best means at our disposal, and in the hands of an expert cystoscopist it will rarely be necessary to resort to the method of operating by the suprapubic route described in the book.

The little book is supplied with a very complete bibliography which will be invaluable to those desiring to go more deeply into the subject. There is also an excellent index. To those intending to take up the study of this method of treatment, the book can be recommended as an introduction to the subject.

It is very well produced and illustrated, and the letterpress is free from errors.

THE RADIOGRAPHY OF THE CHEST. Vol. I: Pulmonary Tuberculosis. By Walker Everend, M.A., M.D.Oxon; B.Sc.Lond. William Heinemann, Ltd. 17s. 6d.

The volume opens with a description of the technique for radioscopy and radiography of the chest, and interpretation of the normal shadows seen. The remainder of the work is devoted to classification of various forms of pulmonary tuberculosis and reproductions of plates of chests with descriptions illustrating these various conditions. The reproductions of plates are good; we wish, however, that they showed more of the chest; this is particularly noticeable in Radiogram 21, Case 5, p. 37, *vide*. "Small cavities within the left supraclavicular, and apparently two larger in the infraclavicular areas," where the supraclavicular areas are not shown. Radiogram 32 shows practically all the chest area, and it is a pity all are not like this one.

We are glad to see the stress laid by the author in his last chapter on the necessity of co-operation of the clinician, pathologist, and radiologist for increasing our knowledge of disease. This could be done in other fields where X-rays are employed, with advantage to all concerned.

The volume should prove of value to physicians and radiologists who specialize in diseases of the chest.

MILITARY PSYCHIATRY IN PEACE AND WAR. By C. Stanford Read, M.D.Lond. London: H. K. Lewis and Co., Ltd., 1920. Pp. vi + 168. Price 10s. 6d. net.

The author was medical officer in charge of "D" Block, Royal Victoria Hospital, Netley, during the later stages of the war. In that capacity he had abundant opportunities of studying the cases of mental disorder coming from all the British Expeditionary Forces overseas, as "D" Block was the clearing hospital to which such cases were sent, and from which they were distributed to the large mental war hospitals. The nature of a clearing hospital is such that it is impossible to carry out a prolonged study of the patients who pass through it, but Dr. Read was able to follow up his patients, and has been able to give a summary in tabular form of the classification of the mental disorders and of the final distribution of the patients.

The first two chapters are devoted to an analytical study of the "Psychology of the Soldier," and to "Military Psychiatry during Peace." The most valuable portion of the work is the consideration of the various psychoses which occurred in soldiers coming from Overseas. "Though it is more or less universally found that no special war psychosis exists, it has been evident that the environment and circumstances of warfare do tend to bring about certain mental reactions, which, though seen in other situations, are not there so common." No unprejudiced reader can fail to see that the author is a keen believer in the psychogenic origin of the majority of the psychoses, and that the study of war psychiatry in the light of the experience of the Great War has thrown emphasis upon the emotional side of life as the potent factor in the origin of neuropathic and psychopathic disorders.

Apart from the study of the psychoses which were common in soldiers invalided from overseas, Dr. Read has contributed much that is of importance in connection with various ancillary subjects such as the recruiting of the mentally unfit, the value of treatment and segregation at the earliest possible time after the

development of mental symptoms, and the importance of a mental examination in all cases of frequent breaches of discipline.

One of the most interesting chapters is devoted to the study of the etiology of the psychoses of war. In this brief notice it is impossible to follow the author through all the contributory causes, but he has some very pertinent remarks to make upon what have been called "exhaustion psychoses," the influence of climate, heatstroke and sunstroke, the effect of the malarial poison, of head wounds and of alcohol in the etiology. He maintains along with many modern psychiatrists that mental conflict is the *fons et origo* of the psychoses, and that in the psychoses of war the factor for study is the question of adjustment to environment which the soldier is consciously and unconsciously always endeavouring to bring about.

The work is full of interesting suggestions to all workers in psychiatry, and forms a most valuable contribution to the literature of war psychoses.

W. S. P.

THE SYSTEMATIC TREATMENT OF GONORRHŒA IN THE MALE. By Norman Lumb, O.B.E. Second Edition. London: H. K. Lewis and Co., Ltd. Pp. 123.

That this little book has reached a second edition in a little over two years shows that it has filled a want in the medical library.

The author lays down the methods of treating a case of gonorrhœa in all its stages in a clear and dogmatic manner, which should make it very useful to the student and to the practitioner taking up this line of practice.

The book is clearly the outcome of extensive experience, and we can strongly recommend this little work as a clear outline of the present position with regard to the treatment of this serious disease. The book is well produced and free from typographical errors.

Correspondence.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—With reference to the original communication by E. Emrys-Roberts, M.D., in your April number, on "The Use of Normal Horse Serum Inoculation in the Treatment of Sepsis," I wonder could any of your readers inform me if and with what results they have used it in cases of (*a*) puerperal sepsis; (*b*) acute infections, i.e, pneumonia, spotted fever, typhus, etc.; (*c*) other diseases, as although the precise mode of action on the leucocytes and plasma is not known it is certain that the patient's individual resistance powers are stimulated and greatly increased, and the results as exemplified in the paper under notice are distinctly encouraging and would appear to suggest an extension of the use of normal horse serum in massive doses subcutaneously to a wider field of operation.

B.S. Hospital, Solem,
Simla Hills,
June 2, 1920.

I am, etc.,
G. H. WOOD,
Captain, R.A.M.C.

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Original Communications.

MILITARY CONVALESCENT DEPOTS IN FRANCE DURING THE GREAT WAR.

BY L. GRAHAM BROWN, M.A., M.D.OXON., ETC.
Lately Acting Lieutenant-Colonel, Royal Army Medical Corps.

PERHAPS it may not be too great an exaggeration to assert that the true meaning of the term "Convalescent Depot," as applied to such an institution in France during the Great War, is as little understood by those of the medical profession, who have never actually been engaged in work connected therewith or come in personal contact with it, as by that vast majority of the nation whose business it has been, not to enter the ranks of the fighting forces, but to remain at home to carry on the necessary industries and preparations of war. To the latter the term might easily mean nothing more nor less than an institution to which the soldier came to recuperate after an illness or a wound, and from which, whenever it was considered expedient, he went to take up his duties again in his respective unit of the service. But to the active worker in the depot, as no less to the patient himself, it meant far more. It meant, not only a re-creation or recuperation of the man's physical powers, but also—something which was of equal if not far more importance—a re-creation of his mental and moral character. It was soon recognized how useless a proceeding it was to heal men's wounds and cure their illnesses without at the same time raising their moral tone, if such men were to be expected to take their places as efficient and courageous soldiers of the firing line. How then was this to be effected? Clearly, considerations, other than the purely physical, had also to be taken into account. The man had to be placed in an environment where spiritual influences could likewise work their effect.

It will be interesting, then, to trace the development of this idea in such an institution as a convalescent depot from its origin at the beginning of the war (for it is essentially a product of the war) up to that almost perfect elaboration that existed in numbers throughout France at the time of the signing of the Armistice.

During the early period of the war it was considered adequate by the authorities to send most cases of sick and wounded to hospitals in Great Britain, thence to convalescent homes throughout the country, which in turn passed them on to the command depots, which again supplied the necessary drafts for réinforcements overseas. On the other hand, those slight cases that could be discharged "fit" from hospitals in France returned, straightway, to reinforcement or Base Detail Camps in that country, and were in due course sent up in successive drafts to the Front. Such a state of things continued so long as the Expeditionary Force remained comparatively small in numbers; there were sufficient hospitals in France and England to meet all requirements; and, moreover, the problem of transport had not become acute. From the second year of the war onwards to the time of the signing of the Armistice other factors began to play their part, chief of which were, the problem of transport across the Channel, accentuated by the ever increasing submarine menace, and the possibility of the enemy obtaining possession of the Channel ports of Boulogne and Calais; the loss of time and consequent wastage of fighting troops in sending them to and fro; and, lastly, the obvious loss of morale such troops underwent during that period of convalescence in England when family influence and the environment afforded by too sympathetic friends played their usual part.

Such factors determined the War Office officials immediately to set about the task of constructing many new hospitals and convalescent depots throughout France, and the need of the latter will be made clear when it is stated that there were sixteen convalescent depots in existence in that country at the close of the war.

To the Medical Service was entrusted the task of suggesting the details for construction of these depots, and into its hands naturally passed the duties of their administration. Indeed, to the higher authorities of the Army Medical Service must be given practically the whole praise for the development of, and the excellent results obtaining from, the convalescent depot system, since in their hands lay the full administration of these establishments, and upon their shoulders rested the whole responsibility, not only of returning the healed, sick and wounded soldiers back to the fighting line, but also of instilling into them the proper fighting spirit and willingness to shoulder again their burdens of war. Moreover, in the realization of such a scheme the medical authorities, when framing their policy, had to bear in mind the fact that, now that the vast majority of convalescents were to be kept in France, and had no longer the oppportunity of going to England where they might be within easy reach of

their homes and friends, by way of compensation the men should be provided with an environment as near as possible approximating to that obtaining in England, and where, too, their minds could be diverted for the time being from the immediate horrors and discomforts of war. Hence it was considered, not sufficient to place men in camp areas, some distance behind the firing line, but to choose for them congenial spots, such as near the seaside, and to provide them with all the relaxation of both mind and body as would tend to make their lives during their stay healthy and happy, as well as comfortable.

It is with the description of the fully developed stage of the convalescent depot that this article is concerned.

Situation.

In their choice of sites the authorities are to be congratulated. Such sites could not be chosen haphazardly. From the point of view of beauty, healthiness, and congeniality many parts of France afforded choice; but this in itself was insufficient. Along with general hospitals, upon which they depended for their supply of patients, convalescent depots were limited in this choice of locality, chiefly by the consideration of easy railway communication, not alone with the Front, but also with base ports and towns, such as were concerned with the provision of food, stores and material, and the collection of drafts and reinforcements. There were, indeed, instances of convalescent depots standing alone, but usually the practice was to group general hospitals with these into the same approximate area, the whole area conforming to the above mentioned facilities of railway communication.

The next consideration was that of the patient. He needed a healthy location, the environment of town life, which he might occasionally be permitted to experience, though always at the expense of some physical effort on his part, such as in walking to and fro, and a maximum of camp space in the form of playing fields to enable him, whenever possible, to partake in his large numbers of adequate healthy and vigorous exercise. Hence, to meet all these requirements, a typical site chosen might be described as follows: It was on a hill, near the sea, and within two or three miles of a town, the town itself being either a Base Port, or within easy communication of the latter by rail, road or water. It was away from the immediate environment of war, though necessarily not absolutely immune from air attack, whilst, by means of its neighbouring town, it formed a link in the great chain of railways that went to make up the lines of communication in France. That convalescent depots should have been located near such ports as Boulogne, Le Havre, Trouville, and Marseilles, it will be seen, was a foregone conclusion.

Structure and Plan.

The limit of accommodation for the ordinary sized depot was for a maximum of 5,000 men, not including the permanent staff personnel. On the other hand there were a few depots constructed to house but half that number. For the sake of convenience it will be preferable to deal alone with the description of the former.

It will readily be seen that, to enable each man, amongst so large a number as 5,000, to live comfortably, both by avoiding overcrowding and by conforming to all necessary conditions for health and hygiene, a very considerable amount of accommodation was necessary. That most useful invention of the war, the standardized Nissen Hut, was the unit of housing fixed upon for the fully developed idea of the convalescent depot. Three hundred-and-twenty of these, together with eight for the accommodation of the staff personnel, were used up in the housing requirements of the fully-working depot. These huts were so arranged, side by side, and in parallel rows, as to form a system of blocks, each block of hutments being called a division, and each division comprising four separate companies. Hence, a simple process of calculation will determine the fact that the whole depot, as far as housing accommodation was concerned, was divided up into five separate and distinct divisions of sixty-four huts in each, each division consisting of four companies, and each company comprising sixteen huts. On this unit system of divisions (distinguished by the numbers 1, 2, 3, 4 & 5) and companies (named by the letters of the alphabet. A, B, C, etc.) depended, as will be seen later, the administration of the whole depot for its simplicity and efficiency. So much for the question of housing accommodation. To complete the description of the division as a unit of the depot one had only to mention a few other additional buildings and requirements. These were, the so-called Medical Inspection Hut, used both as an office for the work of administration of the division, and, as its name implied, as an inspection room for medical examination of patients, and treatment of minor cases; a Nissen Hut misappropriated from one of the companies and fitted up as a small hospital for the retention and treatment of mild cases of sickness, etc.; further misappropriations of huts which were used as store rooms and company offices; an ablution shed containing an adequate number of wash basins and boilers for the provision of hot water; at a suitable distance away from the patients' huts, a system of urinals and latrines together with a highly efficient type of Horsfall destructor; and, finally, a water supply and drainage system, and an electric light installation, each of these connecting with and conforming to the general arrangement of supply for the whole depot. This plan applied alike to every one of the five divisions of the depot.

There now remain only depot buildings, apart from those of the divisions that have already been mentioned, to be described in order to allow one to form a conception of the lay-out and structure of the complete depot. Such buildings, constructed out of wood with galvanized iron

roofing, were for the most part placed centrally to the five separate blocks of divisions. They comprised : the Administrative Offices, viz., those of the commanding officer, his adjutant, and his orderly room clerks; the guard room and police quarters ; large dining halls, capable of seating 2,500 men at a single sitting, and with kitchens, washing-up rooms, vegetable preparing rooms, butcher's shop, and pantry attached ; barber's shop, dental surgery, dispensary, fire station, Expeditionary Force canteen, Quartermaster's stores; bath-houses with hot and cold water laid on, laundries and incinerators. In addition one must include a self-contained establishment on a small scale for the lower ranks of the permanent staff personnel, and also a serjeants' mess for all warrant officers and non-commissioned officers above the rank of corporal who at any time happened to be on the nominal roll of personnel or patients of the depot ; and, lastly, the officers' mess and quarters which, as a rule, were set apart in some appropriate spot near the main depot buildings.

A light Decauville railway, connecting with some wayside station on the wide-gauge railway, served to bring both patients and stores to the depot, and this proved a saving of considerable time and expenditure of energy on the part of road-transport vehicles.

The above-mentioned structures comprised the depot proper. The authorities, however, wisely allowed certain religious associations, participating in war-work, to contribute to the happiness and welfare of the men. These associations were housed in wooden buildings erected by their various governing bodies, and such buildings served as canteens, churches, places of amusement, and for educational purposes. Hence, each depot could usually boast of separate hutments under the direct administration of such as the following : the Young Men's Christian Association (Y.M.C.A.) ; the Scottish Churches' Association (S.C.A.) ; the Wesleyan Church and the Salvation Army. Naturally their work was always subject to the supervision of the commanding officer, who likewise assisted them in matters relating to the upkeep, proper cleanliness, and sanitation of their buildings. Such huts, either intermingled with the depot buildings proper or else in close proximity to them as a whole, certainly proved an inducement towards keeping the convalescent patients within the confines of their camp area, when, otherwise, they might have felt inclined to roam farther afield, or into the neighbouring town, in search of pleasure and occupation.

In conclusion, in order to arrive at an approximate idea of the whole general plan of a convalescent depot one has but to place in the mind's eye this assortment of buildings upon a space of land nine or ten acres in extent, allow the non-occupied portion to consist of roadways, paths, several parade grounds, flower and vegetable gardens, and add to this whole four or five more acres of ground in the shape of playing-fields. Such an institution, as has already been said, might have stood alone in a certain locality, but more often one found it in conjunction with similar

ones and with general hospitals, the whole comprising the system of a large hospital area.

PERSONNEL.

For the administration of such an establishment it will be well to consider now the question of personnel.

Since the larger type of institution was gradually evolved during the course of the war, it was natural that the actual requirements of personnel should only have been determined by experience. Indeed, it was not until a few months before the Armistice that the matter was finally settled, and then the War Office issued an authorization for the employment of a definite number and quality of personnel. The number had necessarily to be a minimum, for the question of man-power at the Front was one always occupying—and rightly so—the minds of the authorities on the War Council. As regards quality, this was a matter not so easily settled. In the beginning it was considered sufficient, and also the right principle, to employ in the depot men from that residuum of all Services who had on enlistment been classified in the lower grades of physical fitness, or who had, through wear and tear of active service, been reduced on re-classification to such a category. For practical purposes there were used in France four grades of classification, and these might briefly be tabulated as follows :—

(i) Category A, which meant that a man was physically fit for duty anywhere and in whatever branch of the Service to which he happened to belong.

(ii) Category B 1, wherein a man was considered fit for duty anywhere except in the firing line.

(iii) Category B 2, applying to men judged fit for duty on the lines of communication; and finally

(iv) Category B 3, referring to men only suitable for sedentary occupations, such as those of clerks, storemen, etc., on the lines of communication and at base depots.

Now, at the beginning of the era of convalescent depots it was the B 2 and B 3 men who were detailed to act as personnel. These, too, were found to be, on the whole, men suffering from physical debility as the result of illnesses rather than of wounds, and, in consequence, the truth of that maxim was soon made very evident to all concerned, namely that (in accordance with that classification in vogue in England during the early stages of the war) one could not expect to find an A 1 mind in a C 3 body. Hence, since efficiency was the test, the policy of having unfit men occupying the higher posts of administration and command in the depot, such as those of Officers, W.O.'s and N.C.O.'s, had to be changed, and rightly too, for it was upon these men that the results of efficiency depended, such results being vital to the proper course and conduct of the war, since they meant a continuous replacement of reinforcements to help

keep pace with the wastage of troops that was daily occurring in the field. Unfit administrators might easily have accomplished this result as regards numbers, but it needed Officers, W.O.'s and N.C.O.'s possessed of high physical and moral qualities themselves to make convalescent patients fit, and at the same time instil into them such a standard of morale, and often at a time, too, when the cause of the Allies appeared by no means to be prospering, as would ensure their efficiency as first-class fighting troops. The change of policy, therefore, amounted to this. The administration of the depot being in medical hands, medical officers were demanded of a category "A." These were assisted in their work by regimental officers of a category less than "A," who by a process of elimination could be tried and chosen for their efficiency in the class of work expected of them. W.O.'s and N.C.O.'s could belong to the categories either "A" or "B," but, like the officers, were chosen for their physical and moral qualities, their previous service at the Front, their powers of leadership and command, and, above all, their tactfulness in dealing with subordinates. Since the patients of a convalescent depot were a mixed assembly derived from practically every unit of the Service, it was obvious that those placed in authority over them should be experienced. Hence, the W.O.'s and serjeants of actual fighting units were those who were naturally chosen to fill the responsible posts of attending to the discipline and welfare of the men of each of the twenty separate companies of the depot. Other personnel were not so important, and consequently were for the most part of a lower category than "A" and even extended to B 2 and B 3 men. Included amongst these were cooks, butchers, sanitary men, dispensers, R.A.M.C. orderlies, a bootmaker, tailor, carpenter, office clerks, physical training instructors, storemen, police, batmen, and finally bandsmen and entertainers.

The following table may serve to give an approximate idea of the authorized complete permanent staff attached to a Convalescent Depot. In each case the rank, service and duty of individual personnel are briefly stated.

A consideration of the following table will quickly reveal the fact that, as far as Officers and W.O.s were concerned, the depot was adequately staffed, but that, as regards N.C.O.s and other ranks, there was a well-marked deficiency of personnel, especially in respect of lower grade N.C.O.s for the purpose of maintaining discipline, and other ranks in the shape of cooks, sanitary men, barbers, dining-hall assistants, bootmakers, tailors, clerks, and practically every class of worker that had to cater in some respect or other for so large a complement of men as five thousand, a number, too, that rarely fell lower on an average than four thousand. But such an understaffing in the matter of N.C.O.'s and other ranks was fully intended by those authorities who were responsible. The reason for this can be easily stated. From so large a number as five thousand men, collected together from practically every unit in France, and in turn

recruited from every profession and occupation of civil life, it was obvious that sufficient workers could be obtained from among the patients themselves to close up the deficiencies of personnel in every department of the depot. Such indeed proved to be the case, and it was found that men readily came forward and gave their services as cooks, clerks, and so on, during their period of stay in the depot. It was, perhaps, too much to expect them to give such service without reward of some kind, but on the other hand it was neither in the power of, nor to the interests nor wishes of a commanding officer to retain such service indefinitely. Hence originated a system of convalescent patient employment, and this, in its fully developed state, became in the administration of the depot a distinct department, appropriately termed the labour bureau. A few words in explanation of this department will not be out of place.

TABLE OF PERMANENT STAFF PERSONNEL.

Class of personnel	Number	Rank	Service	Duty
Officers.	1	Lieut.-Col.	R.A.M.C.	Commanding Officer of the Depot
	6	3 Majors and 3 Capts.	R.A.M.C.	Five of these medical officers in charge of Divisions, the remaining one in charge of Sanitary and other Depot Departments
	1	Capt.	Regimental	Adjutant and Quartermaster; duties chiefly disciplinary
	1	Lieut.	,,	Assistant Adjutant and Quartermaster; duties chiefly connected with Q.M. Department
	1	Capt.	,,	Chief Physical Training Instructor to the Depot
	1	Capt.	General	Dental Surgeon to the Depot
	3	Capts. or Lieuts.	Regimental	General duties connected with the Depot and its Departments
	3	Capts. or Lieuts.	—	To conduct drafts of men discharged from the Depot to their various Base Depots
	3	Capts.	Army Chaplains' Department	To provide religious services for men of their own Church, and to act as voluntary assistants in Depot work
	1	—	Red Cross	A searcher for information regarding killed and missing soldiers
Total	20			
Warrant Officers. Class I.	1	Serjt.-Major	Regimental	To assist the Adjutant in all his duties; styled Depot S.M.
	5	Serjt.-Major	,,	To assist Divisional Medical Officers; styled Divisional S.M.
	1	Serjt.-Major	Army Gym. Staff	In charge of the Physical Training Staff
	1	Qmr.-Serjt.	Regimental	In charge of the Depot Q.M. Stores
Total	8			

TABLE OF PERMANENT STAFF PERSONNEL—*Continued.*

Class of personnel	Number	Rank	Service	Duty
Warrant Officers. Class II.	20	Coy. Serjt.-Major	Regimental	Each in charge of a Company of the Depot (approximately 250 men)
	20	Coy. Qmr.-Serjt.	,,	Each in charge of a Company Q.M. Stores
	1	Qmr.-Serjt.	,,	In charge of the clerical work of the Orderly Room Department
	1	Serjt.-Major	,,	Bandmaster
	5	Coy. Serjt.-Major	Army Gym. Staff	Each attached to a Division as Physical Training Instructor
Total	47			
N.C.O.'s	20	Serjts.	Army Gym. Staff	Each attached to a Company as Physical Training Instructor and in charge of games
	3	Serjts.	Regimental	Each a master-cook and in charge of a kitchen
	4	Serjts.	,,	A tailor, butcher, shoemaker and carpenter, and each a master of his trade
	1	Serjt.	R.A.M.C.	In charge of the Dispensary
	1	Serjt.	Regimental	In charge of the Police of the Depot and the guard room
	1	Serjt.	,,	In charge of the Pay Department of the Depot
	1	Cpl.	,,	In charge of the Barber's Shop
	1	Cpl.	R.A.M.C.	In charge of the Sanitary Squad
	1	Cpl.	Regimental	In charge of the Concert Party Entertainers
	2	Cpls.	,,	Assistant clerks in the Orderly Room and Pay Department respectively
Total	35			
Other Ranks	20	Privates	Regimental	Cooks
	5	,,	,,	Sanitary Squad
	5	,,	R.A.M.C.	Orderlies
	2	,,	,,	Dental Mechanics, to assist Dental Surgeon
	5	,,	Regimental	Officers' Servants
	28	,,	,,	Bandsmen and Entertainers
	5	,,	,,	Clerks in various offices
	6	,,	,,	Policemen
Total	76			

Grand total 196.

Patient Employment Department or Labour Bureau.

The department was placed under the direct administration of the sanitary officer, who in fact embraced under the same system his own particular sphere of sanitary work, and undertook at the same time the supervision of all those extra tasks, such as maintenance of roads and paths, carpentering, painting, the construction and upkeep of vegetable and flower gardens, and the general scheme for ornamentation of the depot area, and a hundred and one occupations of a similar nature, such as were not only essential from the point of view of efficiency, but likewise were conducive to the formation of a congenial environment for all, both patients and personnel. On his shoulders rested the responsibility of seeing that, by his system of "patient" employment, all departments were kept up to the full level of their allotted staff. This system was elaborated, after due experience and trial and in conformance with the limitations imposed by higher authorities, upon the following principles. With a very few exceptions, in all not exceeding thirty, and such only where continuity of employment was found to be not only beneficial but essential, the employment of no convalescent could extend over a longer period than five weeks. No patient could be employed who was not equal to the work demanded of him. All applications for employment were voluntary and could be terminated at the discretion of the medical officer in immediate authority, such authority depending upon the scheme whereby every patient in the depot came under, for the purpose of medical supervision and administration (the latter necessarily including discipline), the command and authority of the medical officer in charge of that division to which he had been allotted. Further, every patient, at the termination of his five weeks' employment, was allowed an extra week's stay in the depot during which he was made to follow the normal routine of physical training and such other work as was from time to time demanded of him. Finally, excluding the above-mentioned few exceptions, the total time of stay in the depot, whether a man had been employed or not, could not exceed six weeks.

Keeping such principles in view the officer in charge of the labour bureau set up his office in some central spot in the depot, and by means of outdoor notices invited applications for employment in the various departments where vacancies were pending. Since to the majority of patients life in a convalescent depot was pleasant enough, and a prolongation of stay most desirable, and it was the policy of all concerned to create and maintain this feeling, it was obvious that applications for employment were quickly forthcoming. Indeed, the supply in most cases exceeded the demand. Then it became the task of the employer to sift the respective merits of all those concerned, and employ him who most fulfilled all requirements. Preference, too, was naturally given to those who had served longest at the front. Aided by his clerks, themselves employed patients, the officer concerned in this duty kept nominal rolls of all

employed men, showing the department wherein employed, and giving the dates of their arrival in the depot, an important item for the calculation of their legitimate period of employment, and of the beginning and proposed termination of such duty. Thus, by a process of anticipated provision and relief of employment, the work of the depot in its many complexities and varieties was kept running smoothly, though the vast majority of the workers were constantly changing. And that such a majority of extra workers did actually exist will be made clear by the statement that it was found absolutely necessary to employ at any given time no less than about five hundred patients in addition to the established number of permanent staff personnel (196) previously mentioned.

DIVISIONAL ADMINISTRATION.

In considering the work of administration of the division, one must bear in mind the unit system on which it was based. As stated, a division consisted of four companies, each company when at full strength comprising 250 men. It was placed in charge of a medical officer of the rank of major or captain (three majors only being allowed in accordance with the authorized establishment of a depot), and he in turn was responsible to his commanding officer. He was styled a divisional commander. His responsibilities were great, in that he had to play the part, not only of medical adviser and provider of all necessary requirements, but also of guide, philosopher and friend to the 1,000 men immediately placed under his charge; moreover, he had to supervise his buildings and equipment, see to their proper maintenance, and, furthermore, direct plans for the useful ornamentation of his whole divisional area by means of flower and vegetable gardens, woodwork construction in the shape of barriers and rustic-work, painting of offices, whitewashing wherever necessary, and other numerous tasks of a similar nature. He was assisted in this by a regimental (styled divisional) serjeant-major, four company serjeant-majors, each in charge of one of the companies of the division, a quartermaster-serjeant, a Royal Army Medical Corps orderly and a Royal Army Medical Corps sanitary man. To this nucleus of permanent staff personnel he had power to add by means of his own authorized system of divisional employment of convalescent patients. Thus he could supplement the above personnel with other necessary assistants in the shape of clerks, nursing orderlies, hut orderlies, workers for the dining-hall, sanitary men, carpenters, road and path-makers, wash-house attendants, and so on. All such employed patients were necessarily over and above that number provided by the labour bureau for depot employment, which latter only indirectly affected the division.

Naturally the divisional commander's chief concern lay in the medical supervision of his men, and the promotion of their happiness and comfort. Hence, his first duty on receiving an allotted batch of new arrivals from the general hospitals was to house them in one of the four companies of

his division, attend to their immediate wants in the form of baths, clean underclothing and equipment, and then proceed to classify them medically according to a system in vogue in the depot whereby a man's state of physical fitness was considered in relation to the work expected of him, and of which he was capable. The usual card index system facilitated this task of the divisional commander by keeping a record of the history, progress and activities of every individual patient from the time of his entrance to the depot to that of his departure.

For the purpose of medical classification the three following categories were decided upon for use in the depot, viz.:—

(1) Category "A," which included all those who were at any moment fit to leave the depot and rejoin their various units.

(2) Category "B" which applied to the vast majority of patients in the depot, and comprised all those capable of carrying on with the ordinary routine of work, or of accepting employment under the scheme of depot maintenance.

(3) Category "C," which embraced the remainder, and referred to those who were temporarily debilitated from sickness or wounds, or otherwise incapacitated by one or more of those irksome concomitants of military life, such as, for instance, scabies, boils and other eruptions, slight fevers, and the numerous forms of sore legs and blistered feet, which, though not serious in themselves, nevertheless rendered many a soldier comparatively inactive, thereby increasing to an enormous extent the temporary loss of war personnel.

Once classified, the patients, now forming part of the total complement of the division, were at liberty to conform to all those varied requirements which formed the manifold activities of work and play in the convalescent depot. From time to time, usually at intervals of not more than a week, they underwent further medical inspections, when according to the judgment of the divisional commander their category was raised, or lowered, or left unaltered, as the condition might warrant. In addition, the usual routine of holding early morning sick-parade afforded the necessary medical attention to such as required it from day to day.

Certain rules, elastic to a slight degree, guided this medical officer in charge of a division in his determination of the length of stay of each patient in the depot; but, generally speaking, and from a consideration of statistical records, it might be said that the stay of all convalescents, including those employed as assistant staff, usually averaged a period of four weeks. Of course, from time to time, such as during times of great stress and severe fighting at the front, this standard had necessarily to be lowered, but, as a rule, the policy aimed at allowing every man a sufficient period of time in the depot during which he might benefit from all those physical, mental, and moral influences at work on his and the Army's behalf. And herein lay the greatest task of the divisional

commander, in seeing that his men were placed in the right way of such influences.

Let us see then what these influences were and in what way, when properly directed, they severally affected the convalescent patient.

Although their division into moral, mental and physical influences may perhaps seem arbitrary and artificial, it will serve, nevertheless, for the purposes of description.

Let the moral influences first be considered. As a rule, and especially after a period of great strain resulting from wounds or sickness contracted during lengthy periods of monotonous, varied with exciting, service at the front, from war-weariness in general, or even from long periods in hospital, the average patient arrived at the depot depressed in spirits, with diminished self-respect and pride in his associations, and perhaps with the feeling that he had reached the first stage on the return journey to that environment of horror, discomfort, and monotony from which in many cases he had thought he had permanently escaped. This general depression and lack of self-interest was especially marked amongst those who, suffering from slight wounds, sickness, or other disabilities, came almost direct from the firing-line after some great battle, or prolonged offensive or retreat. In the latter instance, they came unkempt in appearance, with clothing and kit torn and incomplete, and with both body and underwear dirty, verminous, and perhaps unwashed for many a week. If the pressure of casualties was not too great and the men had passed en route through general hospitals naturally this pitiable condition had to a great extent been alleviated. But it was at the convalescent depot that they found the real opportunity to regain that pride and self-respect which depended so much upon good and proper clothing and personal cleanliness. How, then, was this accomplished? During the first day or two after the patient's arrival and his allotment to one of the companies of a division his time was kept fully occupied, not in taking part in the ordinary routine work in the depot, but in being medically examined and classified into one of those existing categories previously mentioned, in being refitted with clothing and personal equipment, in receiving a bath and change of clean underwear, and, finally, in accustoming himself to the routine orders, activities, and conditions of his new environment. After this he was considered to be in a more ready frame of mind to receive and be duly affected by those greater influences acting on his behalf.

Firstly, then, in company with his fellows, he was paraded in order to listen to short talks given either by his divisional commander or his divisional serjeant-major. Herein it was briefly explained to him the nature of the institution in which he now happened to find himself, what was expected of him in the way of work and play, and, chiefly, how he could most benefit by throwing himself whole-heartedly into the various activities of the depot, and by accepting, and if not raising at least endeavouring to maintain, that proper tone and true spirit of the place

that was so essentially demanded by all in authority in their efforts to make the patient's environment a healthy, happy, comfortable and character-forming one.

Now, the incentive that encouraged the men to put forward their best efforts was based primarily upon the establishment of a competitive spirit throughout the whole work and play of the depot. Also, they were made to see that the acceptance of such a spirit worked greatly to their own interests. The unit system of companies and divisions afforded the greatest help in the promotion of this spirit of competition. Thus, efforts were at once made to impress the mind of every convalescent patient with the fact that it was incumbent upon him to do his best to raise the name and fame of his company, and, by so doing, indirectly of his division, in keen competition and honest rivalry against all others. By so doing, he along with his fellows attained to that pride of place in the depot which became honoured and prized for its own sake, although the authorities were wont to recognize such merit in the form of individual prizes, and silver shields and cups for successive competitions. Since the average patient's stay in the depot was for a month, this period of time was made the unit for all kinds of competitions. During it, everyone strove to place his company, and hence his division, in the lead to win the various cups and shields. Naturally, the greater number of these were offered for competition in the many different forms of sport such as football, hockey, athletics, boxing, road-racing, and tug-of-war, and a company or a division could win a cup or shield for the highest total aggregate of points in all these several events, thus combined effort being encouraged not only in one direction of sport but in all. Apart from these forms of sport there were also competitions amongst divisions for general efficiency, cleanliness and ornamentation of divisional areas, the latter embracing in turn huts, lines, vegetable and flower gardens, sanitary systems, and, finally, dining halls. Thus, it will be seen that the authorities aimed at the introduction of the competitive spirit into all forms of activity throughout the depot, and the pervasion of such a spirit could react upon the men themselves in no other way than to encourage them to put forth their best effort, whatever that might be. This could be well demonstrated in such a sport, for instance, as boxing. It was recognized throughout the Army as one of the best forms of sport for helping to promote the fighting instinct and to maintain a high standard of morale amongst the men. Thus it was encouraged whenever and wherever opportunity afforded. At the convalescent depot the idea was not to encourage and promote the sport amongst the professional and skilled boxers, and so serve merely as a spectacle for the vast majority, but to encourage every man to take part in it even though he were a mere novice or by nature undesirous of attaining perfection or even moderate skill in the pugilistic art. Encouragement of this sort bore excellent results. Thus, for any given monthly competition it was not unusual to find that as many as eight or nine hundred men took part. By a system

of giving points to the loser of a bout as well as to the winner a man was encouraged to enter for the competition who had not the least pretensions to skill in the noble art, and whose object was, after adequate showing and possibly the acquisition of a bruise or two, to gain a few points for his company's sake, and thus help it on towards its aim of ultimately winning the cup or shield presented for the highest total aggregate of points. Similarly with all other forms of sport. In every instance it was the mere average man who was catered for, and it was, moreover, so arranged that his efforts, however small, tended to help on the pride and reputation of his company or division, as well as benefit himself both morally and physically.

Other moral influences at work can now be briefly cited. The spiritual welfare of the men lay in the hands of the army chaplains of the various denominations. These besides holding their usual Sunday and week-day services, mixed freely with the men, and helped and advised them in their private affairs. Many a problem touching domestic affairs the "Padre" had to solve and many a matter pronounce judgment upon. Moreover, to the work of the chaplains we must add that of the various religious institutions, such as the Young Men's Christian Association, Scottish Churches' Association, Salvation Army, etc., all of which, by the varied facilities afforded in their respective huts, provided for the moral well-being as likewise the happiness and comfort of their followers. Mention, too, should be made of the fact that it was considered part of the duty of a divisional commander to warn his men, by periodical lectures, of the dangers of venereal infections, and urge them to avoid these by refraining from immoral and promiscuous intercourse. No doubt such influences as these were great in themselves but it must be admitted that from the existence of the competitive spirit chiefly resulted that high moral tone pervading the whole atmosphere of the depot.

Let us take next the mental influences at work in the process of re-creation of the convalescent patient. By "re-creation" is meant here that reforming or re-shaping of a man's mental attitude which by stress of war environment has temporarily lapsed, whereby he regains that necessary sense of well-being, self-respect, and pride, without which no soldier can be counted fit to carry out loyally and faithfully those arduous duties imposed upon him, and such as are essential to the conduct of the war.

Apart from the moral influences already described, and which perhaps might also be classed as mental, the mental influences included those less abstract forms which affected the mind directly, and which might be considered under the heading of educational work, concerts and other entertainments, and music as provided by brass bands and orchestras.

Although an educational scheme of instruction for the whole Army in France was just coming into practice about the time of the Armistice, and special instructors in the various subjects had been sought for out of the vast personnel of officers available, such a scheme naturally cannot be

taken into account in this description because its application never had time really to be felt during the course of those few remaining months of the war. We must turn, therefore, to the lesser schemes of education such as were in actual existence in the depot itself, and which were undertaken chiefly by the religious institutions, and particularly the Y.M.C.A. These by direct teaching, such for example, as the holding of classes in French, English, History, Mathematics and the like, and indirectly by encouragement of competitions in essay-writing, drawing, etc., did a great deal to benefit the many men whose desire it was to attain more knowledge and keep their minds mentally occupied. In the same manner, such indoor games as chess and draughts, bridge and whist tournaments, and even billiards, all needing skill and concentration, proved highly beneficial mental relaxations. A depot library, well stocked through the beneficence of the Red Cross Society, was always fully patronized, and materially aided in occupying a patient's leisure hours, which otherwise might have been spent unprofitably on leave in the neighbouring town, or in boredom within the confines of his camp area.

Finally, one must not omit to include under the heading of educational work those occasional lectures and addresses given by the commanding officer or other authority, which were chiefly in the nature of propaganda and intended to keep the men's minds informed of current events and alive to the great purpose and ideals for which the Allies were fighting. Thus, speakers came from time to time to explain such subjects as "The Nation's Need of Economy," "America's Entry into and Effect on the Progress of the War," "The Military Situation," "The Cause of the Allies," and later on, "The Scheme of Demobilization." It was recognized that these and many kindred subjects of like importance were of great interest, if properly explained, to the mind of the average "Tommy," and that nowhere better than in a convalescent depot could such matters be discussed, and that it were folly to avoid giving him such information, since it served to provide more contentment to his mind, and make him fully realize, if not appreciate, his immediate and future responsibilities. Moreover, there is not the least doubt that on more than one occasion a true explanation of the situation did more than any other factor, not excluding even the spirit of discipline, to avert trouble and disturbance of a serious nature amongst large bodies of men who were visibly tiring of the tedium and discomforts of war.

(*To be continued.*)

TICK FEVER IN EAST PERSIA.

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On November 17, 1919, whilst touring the upper sections a wire was received from the A.D.M.S. asking for an investigation into an outbreak of fever in a company of Indian Pioneers working on the road at Sharifabad, north of Turbat, and that influenza was suspected.

On arrival at Turbat eighteen cases from this company were found in hospital under the care of Captain Haji, I.M.S. This officer stated that he first suspected the early cases of being sandfly fever. Firstly, on account of the history, that they had been bitten by insects; secondly, on account of the symptoms, which were those of frontal headache and pains referred to the limbs and back; and thirdly, owing to the fact that blood films were negative both to malaria and relapsing fever. Some of the later cases had marked chest symptoms with frothy sputum and he was debating in his mind whether he should diagnose these as influenza. One case had been diagnosed relapsing fever and spirochætes had been found in the blood.

On going round the wards, it was observed that all of the cases, including the one with spirochætosis, presented the same symptoms during their attacks of fever, namely, severe headache, frequently frontal in type, pains in the loins and down the backs of the limbs or generalized pains all over the body. The majority had palpable spleens and a few had a superadded bronchitic condition. Several of the cases had normal temperatures at the time of inspection and it was noted that their temperatures had come down by crisis and a certain proportion were just commencing a relapse.

On further investigation, it was found that the patients complained of having been bitten whilst living in a serai at Sharifabad and the majority were able to produce proof in the form of well marked healing or healed scars of bites which were usually sited on the wrists, ankles, or neck. Only two or three of the men had seen ticks in the serai and none of them knew the cause of the bites, as they were bitten at night, and being Pioneers doing hard work slept heavily. All cases were provisionally diagnosed tick fever and the daily examination of the blood, using thick drop films, was commenced. The total number of cases admitted into hospital at Turbat from this company was twenty-two and spirochætes were eventually found in four cases.

On November 20, 1919, Sharifabad was visited. This is a village

situated in a narrow elongated valley twenty-three miles south of Meshed at the junction of the East Persian and Tehran-Meshed trade routes. During the winter the cold is severe, chiefly on account of the winds which sweep down the narrow valley. In the village are several old Persian serais which afford accommodation to the personnel of the numerous Persian donkey and camel caravans.

From the information gathered at Sharifabad, it appeared that three platoons of a Mahratta Company of Pioneers arrived at Sharifabad on October 24 to do work on the road and being down-country Indians complained of the severity of the cold. In consequence of these complaints, the officer commanding the company took over and billeted the men in one of the Persian serais after thoroughly cleaning it out and disinfecting the floors of the rooms with cresol. Fires were then lighted in the rooms and a few days later the men commenced to see occasional ticks and complained of being bitten. However nobody apparently connected the ticks with the bites.

The first case of fever reported sick on November 5, twelve days after the occupation of the serai and within the next five days twenty-five more cases occurred. On November 11, No. 14 platoon, strength then thirty-nine, left for Turbat, and whilst on convoy an additional twelve men developed the disease. In all twenty-two cases were admitted to hospital in Turbat from No. 14 platoon. The officer commanding the company at this time began to think that there might possibly be some connection between this disease and the serai, and on November 15 he moved Nos. 15 and 16 platoons into camp, leaving the sick and sick attendants in the serai. The total strength of Nos. 15 and 16 platoons was 110 men; of these, 50 contracted the disease and, out of the 60 effectives left, 24 only were unbitten.

On visiting the serai with the officer commanding the company and the serai keeper it was seen that it was of the usual Persian type, namely, of some considerable age, built of burnt brick, and enclosed within four walls in the form of a quadrangle, the gateway in the centre of one of the walls. The living rooms, some of which were being used for housing the sick, were built against the three inside walls facing the gateway, on a brick plinth about three feet six inches in height. Each room possessed an outside verandah space with which it communicated by means of an open archway. In the centre of the serai was a clear space for the accommodation of the animals belonging to caravans.

At the time of inspection the sick, eighteen in number, were being moved from the serai, and it was seen that they exhibited the same symptoms as the cases in hospital at Turbat. Respiratory complications, however, were not so prevalent amongst them. Whilst looking at the cases the Sub-Assistant Surgeon in charge brought to our notice a sick attendant who complained of having been badly bitten on the neck during the previous night. The bites on his neck were fresh and bleeding and of

the same character as produced by ticks. On looking through his bedding, four ticks were found, one an *Argas persicus* and three ticks of the Ornithodorus species which since have been identified at the Agricultural Research Institute, Pusa, India, as *Ornithodorus lahorensis.* One of the Ornithodorus ticks was seen to be gorged with blood. In all five ticks of the Ornithodorus species and one of *Argas persicus* were obtained in the serai. In this connexion it should be remembered that the Ornithodorus is more frequently seen during the daytime than the *Argas persicus*.

These ticks were shown to the serai keeper and to certain local inhabitants, who were unanimous in stating that both species were dangerous to "feringis" or foreigners such as ourselves. The Ornithodorus was said to be "karab" or bad, and gave rise to a fever of some days' duration, but that the *Argas persicus* was "khaile karab," extremely bad, and would cause some weeks of fever and possibly death. We were also informed that the reason why Persian travellers did not contract these diseases was because each traveller before entering a new serai wet his finger in his mouth and with it picked up some of the dust off the ground and ate it. The "namak" or salt in the dust afforded him protection.

So much for local beliefs.

On arrival at Meshed next day the officer commanding at the general hospital stated that it had been reported to him that several cases of influenza with marked chest symptoms had arrived from Sharifabad. On visiting the wards it was found that the patients were suffering from the same disease as seen at Turbat and Sharifabad but that bronchitic and chest symptoms were much more marked. These complications had probably been aggravated by exposure during evacuation by camel convoy. A large proportion of the cases had enlarged spleens and normal temperatures, having recovered from their first attack of fever *en route.* Bite lesions were observed on the extremities of the majority, and, in one case only had spirochætes been discovered. The records of temperatures at Sharifabad and past histories of the patients were handed over to the officers in charge and further observation, and in some instances the finding of the parasite soon convinced them that they were dealing with a fever of a relapsing type having many points of difference between it and the relapsing fever which they had been accustomed to encounter in Meshed.

General Aspect of the Disease.

In June, 1919, one of us, viz., C. H. H. H., had the opportunity of seeing nineteen cases of tick fever contracted in serais in Jinnuk and district. The clinical picture and subjective symptoms of all these cases were the same and as briefly described in connexion with the cases in the hospital at Turbat. Their temperature charts were all of the same type and usually showed a short initial fever of a moderate intensity of one to five days' duration followed by numerous spiky relapses which rarely lasted

for more than one day. The temperature of the patient during a relapse as a rule reached 104° F., and the crisis was usually accompanied by sweats and a moderate degree of collapse. Chest symptoms did not predominate, probably because the outbreak occurred during the hot weather.

In the Sharifabad outbreak, 72 cases were admitted to hospital, 50 at Meshed and 22 at Turbat. The first sixteen cases arriving at Meshed and several of the Turbat ones showed signs which at first pointed rather to influenza as a diagnosis, viz., more or less generalized pains all over the body, cough and bronchitis, and frothy sputum which in some instances was bloodstained.

During the febrile stages all the Jinnuk and Sharifabad cases presented identical symptoms and clinical signs, but the outstanding feature of this last outbreak was undoubtedly the extraordinary variations in the character of the fever that the individual cases displayed.

Symptomatology.—The symptoms of the disease were those of fever and headache, usually frontal in type, and in certain cases photophobia was observed. This localized headache was more common during the initial attack of fever and in well marked spiky relapses with high temperature. In cases showing mild relapses, or, with a continuous type of fever, the headache was more diffuse. The patient as a rule complained of pains in the small of the back and down the backs of the limbs. Generalized pains all over the body were observed as a rule in cases showing periods of continued fever. In bronchitic cases, pain was at times referred to the region of the sternum. Patients during the febrile stages looked ill and felt very miserable. The constitutional disturbance was not so severe as in the cases of Indian relapsing or Jinnuk tick fevers.

Rigors.—In the low abortive and irregular types of fever rigors were not observed. It was only in the cases in which the rise of temperature was considerable that the onset of fever was preceded by a rigor. At the time of decline of temperature profuse sweating and collapse were rarely seen.

Pulse.—During the febrile stages the pulse was usually full and the pulse rate ranged between 100 to 120 per minute. During the apyrexial periods the pulse maintained its normal rate.

Respiratory System.—Cough and bronchitis were very common respiratory complications in the Sharifabad outbreak, being present in sixty-eight and sixty-four per cent of cases received in hospital at Turbat and Meshed respectively. In four cases the sputum was bloodstained. In the Jinnuk outbreak, which occurred in the hot weather, only ten per cent developed bronchitis, which became worse during the periods of pyrexia and cleared up concurrently with the disease after salvarsan injections.

Hæmorrhage.—No cases of hæmorrhage occurred amongst the cases in hospital at Turbat. At Meshed four cases with hæmorrhagic sputum were observed. One case developed hæmorrhages from the bowel, two cases had

profuse epistaxis, and one bleeding from the gums. The number of cases with hæmorrhages was eleven per cent of the total cases. In the Jinnuk outbreak ten per cent of the cases had hæmorrhages.

Alimentary System.—The appetite was, as a rule, good, and the tongue clean during the apyrexial periods. The bowels tended to be constipated, but in two cases severe diarrhœa occurred. Enlargement of the liver was rarely found, and when present it was not to any appreciable extent; and no case developed jaundice. In the Jinnuk outbreak five per cent of cases developed jaundice.

Spleen.—On palpation the spleen was usually found to be enlarged, rather soft and painful to the touch, and at times the patient complained of very exquisite pain in this region. This enlargement became as a rule more marked during or at the termination of a febrile stage. At Meshed the spleen was enlarged in sixty-eight per cent of cases, and at Turbat in sixty-three per cent. Of the cases in which spirochætes were found thirty per cent had no palpable splenic enlargement. Spleen puncture was performed on four occasions with negative results, as no spirochætes were recovered.

Bacteriology.—Bacteriological examinations were confined to the examination of blood slides, as appliances and animals for other investigations were not available.

Blood Examinations.—The blood of all cases with fever was examined daily for the presence of spirochætes by means of the thick drop method. Total blood counts could not be carried out owing to the absence of apparatus, and differential counts presented no constant feature, but there appeared to be a tendency to increase in the mononuclear elements.

Spirochætes.—The same difficulty in finding the parasite was experienced in these cases as in the Jinnuk outbreak. The spirochæte was rarely found, and when present it was only in very small numbers. At Meshed spirochætes were observed in 14 per cent, and at Turbat 18 per cent of the cases. Of the positive cases, spirochætes were found in 20 per cent during apyrexial periods, in 20 per cent during the initial fever, in 50 per cent during the first relapse, and 10 per cent during the second relapse. In no thick drop film were more than six spirochætes ever observed, the usual number being one or two, and the presence of the parasite during apyrexial periods was contrary to all expectations. These findings offer a marked contrast to the louse-borne variety of Indian relapsing fever, in which numerous clumps of organisms may be frequently seen during the height of the fever in thick-drop preparations, and in no instance during apyrexial periods have spirochætes been observed by us.

Spirochætes were usually found in cases with definite relapses, with a spiky type of temperature chart, and it is interesting to note that in the Jinnuk outbreak in which all cases were of this type spirochætes were found in forty-two per cent of the cases. It was also observed that the parasite

could easily be found during relapses in cases which had previously given positive results, especially in those in which they had been seen during an apyrexial period.

Morphology of the Spirochætes.—In a previous paper[1] on this disease one of us, C. H. H. H., gave as his opinion that the spirochæte might be said to be longer, a little coarser than the Indian variety, and that its spirals were more regular and deeper; the Indian variety being less regular and possessing open flexures. The Persian variety was also said to average from eighteen to twenty-two microns in length without showing divisional characters, and short forms were rarely seen. On one occasion a spirochæte thirty-five microns in length was seen, without any attempt at division being visible in the protoplasm. Looped and figure-of-eight forms were occasionally met with. These observations in regard to the morphology of the spirochæte seen in the Jinnuk outbreak were confirmed by Captain A. S. Fry, I.M.S., Captain J. H. C. Walker, R.A.M.C., and Captain K. Venugopal, I.M.S.

In regard to the spirochætes found in the Sharifabad cases, H. D. W. states it is difficult to give any definite opinion owing to the small number of organisms seen, and as the exclusive use of the thick-drop method resulted in the spirochætes taking on a somewhat "pulled out" appearance. In one case the organisms were not longer than fifteen microns, whilst in another they reached as great a length as thirty microns. The average length of the spirochæte was about twenty microns, and the shorter forms tended to be thicker than the longer forms, which were fine. Similar variations have been noted in the spirochæte of Indian relapsing fever, but the extreme length of the organism has not been so great. The spirals in the Persian spirochæte would appear to be more open than those of the Indian variety, but in no instance could it be definitely stated which form of spirochæte was present.

H. D. W. confirms the observations in regard to the average length of this organism, but it would be interesting to know if he attributes the more open spirals to his so-called "pulled out" appearance resulting from the employment of the thick-drop method. It must be agreed, however, that in no film is it possible to identify definitely the variety of spirochæte present, but the spirochætes seen in a thick film at Turbat by C. H. H. H. were of the same type as the ones observed in the Jinnuk outbreak.

Incubation Period.—In the Jinnuk outbreak all cases were bitten on the one night, and developed the disease within a few hours of each other on the same day, namely, on the eighth day after infection. This outbreak occurred during the hot weather, when ticks are more active, and they were seen within an hour or two of the occupation of the serai. In the Sharifabad outbreak which occurred during the cold weather ticks were not seen for the first few days. In all probability they were hibernating in cracks in

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[1] Journal of the Royal Army Medical Corps, vol. xxxiv, No. 6, p. 484.

the walls, etc., and did not appear until the warmth due to the lighting of fires and the regular occupation of the rooms attracted them. This has been noted during the winter in other Persian buildings.

The first case reported sick at Sharifabad on November 5, 1919, and the greatest number admitted to hospital on one day was on November 9, 1919, twelve and sixteen days respectively after the occupation of the serai. The sick attendant, Yankat Mani, was on duty with the sick in the serai after the evacuation by Nos. 15 and 16 platoons, and was bitten by ticks during the night on November 19, 1919. He was admitted to hospital with tick fever on November 27, 1919, on the eighth day after infection, and no man developed the disease at a later period than eight days after the evacuation of the serai.

Fever.—This subject has already been touched upon under a different heading, but owing to its great importance it requires to be more fully dealt with. As previously mentioned, the outstanding feature of the Sharifabad infection was the extreme diversity in the type of fever presented by the individual cases, and it may be briefly stated that the fever varied from a mild attack of a few days' duration, without subsequent relapses, to a severe continuous rather irregular type of fever lasting upwards of fourteen to sixteen days, which in some instances was followed at irregular intervals by short spiky relapses. The greatest number of relapses seen in any one case was seven, and in all cases as the disease progressed an attempt to reproduce a spiky type of chart similar to the one seen in the Jinnuk outbreak occurred. *Vide* Charts I and II. As a rule apyrexial periods were much longer and more irregular than in the Jinnuk cases, in which the period was usually a matter of a few days only. In the Sharifabad cases apyrexial periods were very prolonged, the longest period on record being forty-one days.

The records of temperature, etc., of the cases at Turbat whilst at Sharifabad and during evacuation by camel convoy are unfortunately not available, but the histories and charts submitted indicate the type of fever, etc., and are sufficiently complete for grouping purposes. In order to ensure greater accuracy, the complete Meshed charts have only been used and reproduced.

The cases of the Sharifabad outbreak may be roughly grouped as follows:—

(*a*) Cases in this group developed an initial fever lasting two to six days. It was usually of a low continuous type and not the high continuous fever seen in louse-borne relapsing fever. This was followed by an afebrile period varying from two to fourteen days, which was succeeded by short periods of fever, frequently, of only one day's duration. In one case seven relapses were noted. Into this group, in which the cases are of the Jinnuk type, thirty-two per cent of cases fall, and in blood films spirochætes were more easily found.

One case, Chart No. II, is particularly deserving of note. The patient

after a preliminary attack of fever and an afebrile interval of two days developed a relapse of two days' duration. During the succeeding afebrile period he was admitted to hospital, and spirochætes were found in the blood five days after the relapse. Two days later he

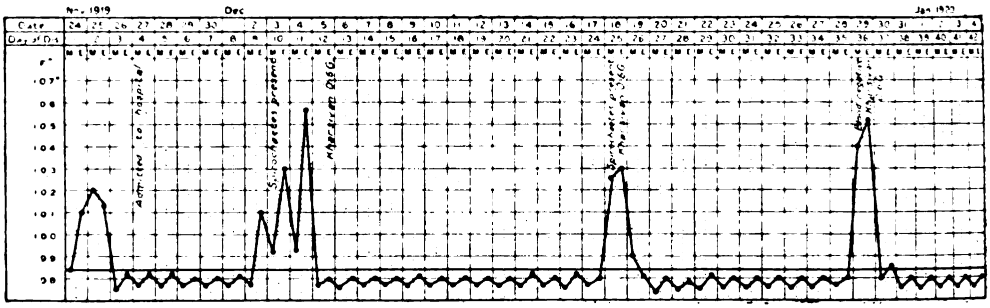


CHART I.

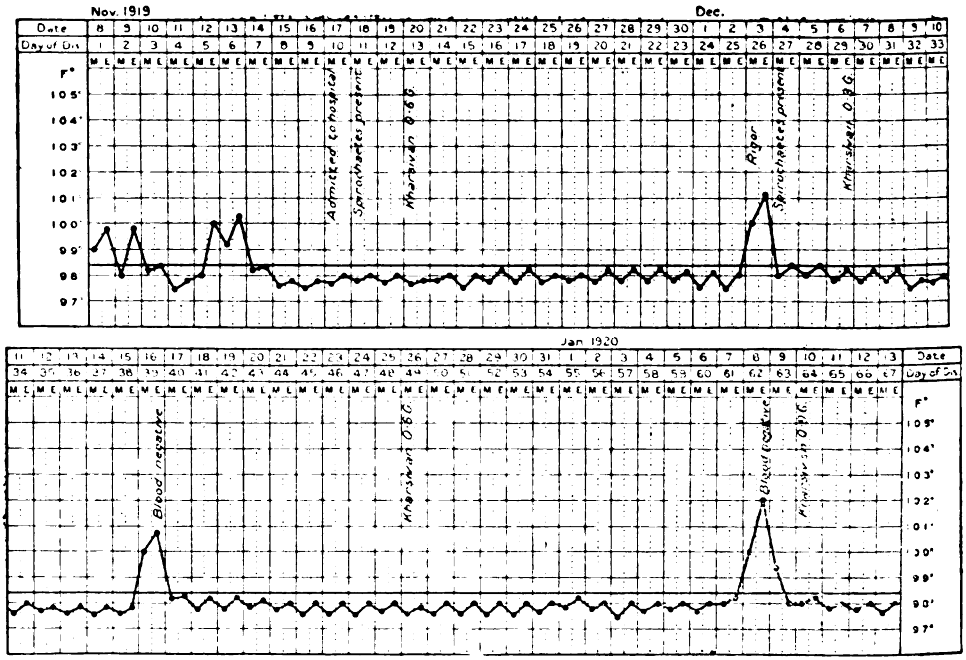


CHART II.

was given 0·6 gramme of neo-kharsivan intravenously, and twelve days afterwards a second relapse occurred in which spirochætes were again found in the blood. Hyperpyrexia of a 106° F. was noted in two cases, in one after an injection of neo-kharsivan. Of cases in which the spirochætes were found, seventy-two per cent are present in this group.

(*b*) In this group the initial fever was low and the apyrexial period short, lasting from one to six days. Following this was a period of somewhat irregular continued fever from four to eight days in duration. Relapses were not common. One case showed a spiky relapse after eleven days, and another three short spiky relapses at intervals of one, three and forty-one days. Twelve per cent of cases fall into this group, and in none of these were spirochætes found.

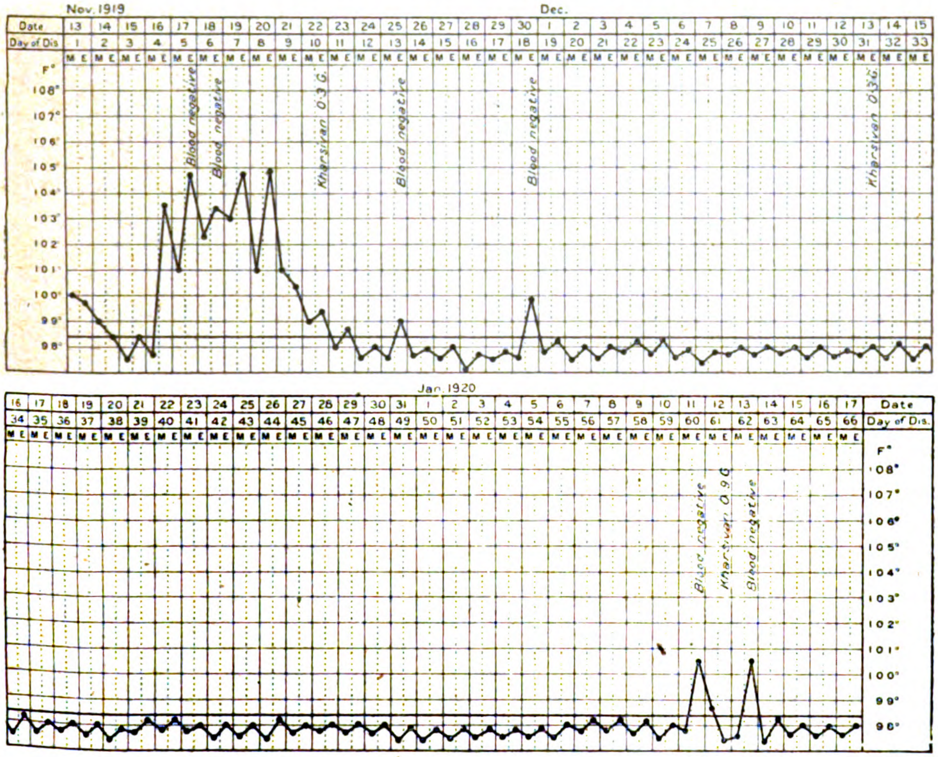


CHART III.

(*c*) In this group cases showed a preliminary low fever followed by a short apyrexial period and then a long irregular fever of upwards of fourteen days' duration. Succeeding relapses, when they occurred, were of the spiky variety. Of the cases in which spirochætes were seen eighteen per cent are included in this group, which comprises twelve per cent of the total cases.

One case in this group, which is referred to towards the end of the paper, requires special mention. This case showed an initial low form of fever followed after an apyrexial period of two days by a period of continuous but irregular pyrexia of fourteen days' duration; no spirochætes were observed during this relapse, and two injections of kharsivan totaling

0·9 gramme were administered intravenously. A short spiky relapse of one day's duration occurred after twenty-seven days, and spirochætes were found in the blood.

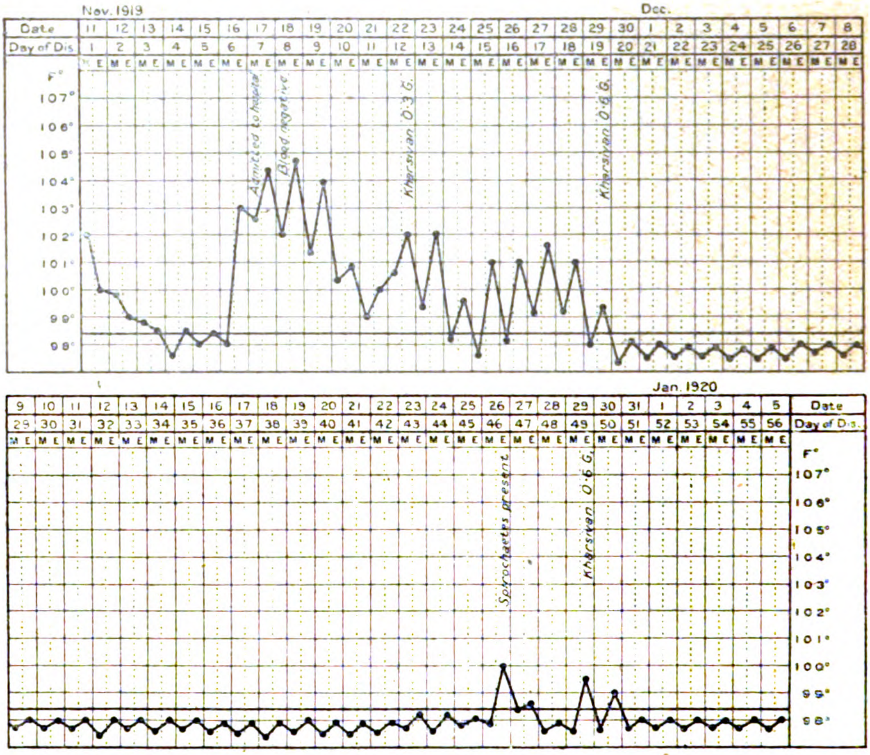


CHART IV.

(*d*) Saddle-back charts, somewhat resembling the one seen in cases of seven-day fever, were observed in four per cent of cases, and in one of these a relapse was recorded after an ap yrexial period of sixteen days.

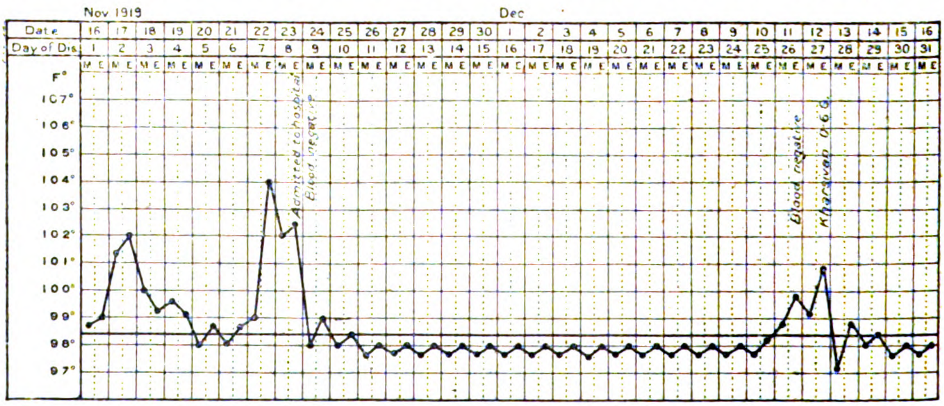


CHART V.

(*e*) One case showed no less than four relapses, during which the fever was of a very low type. These relapses were followed by a period of high continued fever cut short by injection of neo-kharsivan.

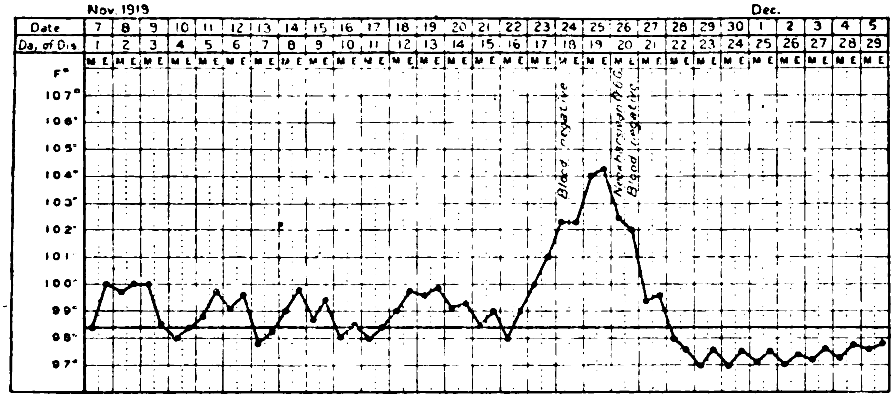


CHART VI.

(*f*) One case showed a very irregular fever resistant to neo-kharsivan.

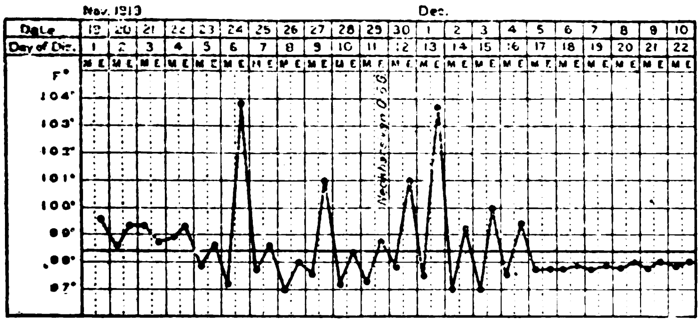


CHART VII.

(*g*) This group of cases developed an initial rather irregular continued fever lasting from eight to ten days. Subsequent relapses were rare, and when they occurred they were of the usual short spiky variety. These cases, which comprise eighteen per cent of the total number, were markedly resistant to neo-kharsivan, and of the ones in which spirochætes were seen nine per cent are included in this group.

(*h*) The remaining eighteen per cent of cases fall into this group. They call for no special comment, clinically and symptomatologically they cannot be differentiated from any of the other cases, they required no specia treatment, and after the one attack of fever of short duration they became convalescent. No relapse occurred in this type of case and in none of them were spirochætes seen.

Treatment.—In our experience injections of salvarsan or neo-salvarsan have always been rapid and unfailing specifics in dealing not only with the Indian but also with Jinnuk varieties of relapsing fever. As a rule one injection of 0·6 gramme given at the height of the fever has proved to be efficacious with perhaps at the most two or three exceptions. In the Sharifabad outbreak in many cases injections totaling 1·5, 1·8 and in one instance 2·4 grammes of kharsivan or neo-kharsivan were found necessary to effect a cure.

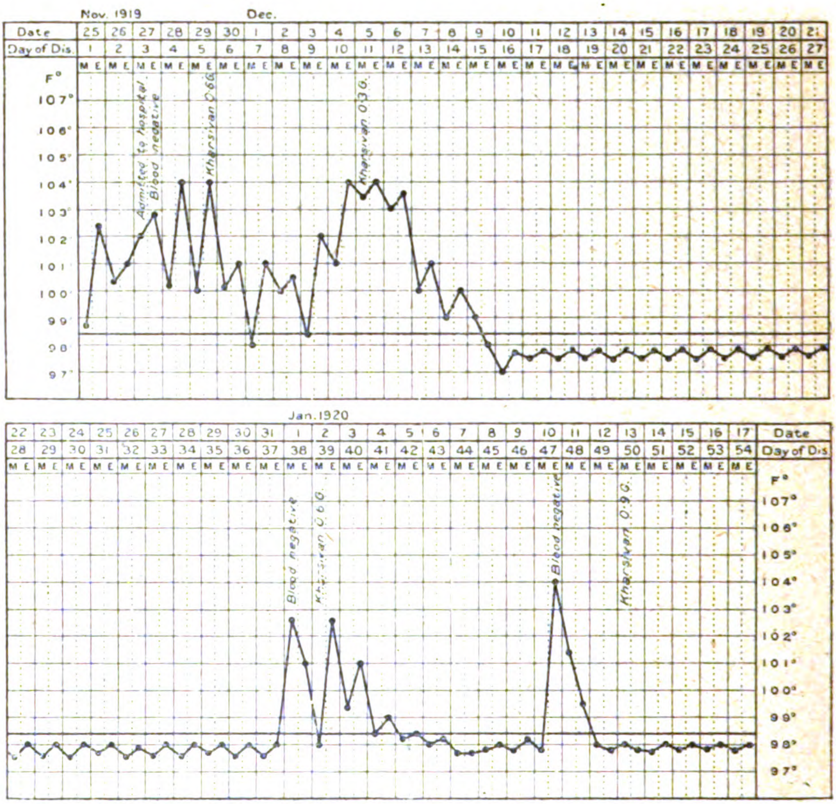


CHART VIII.

In regard to this resistance, it must be admitted that frequently these injections were administered during an apyrexial period, and that the initial doses were too small to effect a cure. Still spirochætes were being found during apyrexial periods, and in the Jinnuk cases small doses of kharsivan 0·3 to 0·4 gramme administered at the height of the fever were found to possess as great a curative value as the larger ones. In spite of these objections there is no doubt that this infection was more resistant to the action of salvarsan products, and, in cases with periods of continued fever, markedly so.

Concluding Remarks.—The Sharifabad outbreak impressed upon all observers the great variability of Persian tick fever, and it is evident that the diagnosis of isolated cases may present a problem of no small difficulty unless the case be one with a clear history of tick bites or of the same type as the Jinnuk cases.

Ever since the Jinnuk outbreak of June, 1919, medical officers on the lines of communication, East Persia, have been on the look-out for cases of fever of that type, but only one or two cases have been reported, and these amongst Indians.

Attached to this force as auxiliaries are levies who for the most part are locally enlisted Persians or Hazaras and are treated in the lines of communication hospitals. The duties of the levies take them continuously into Persian serais and buildings and though they are quite frequently attacked by Indian relapsing fever in no instance has Persian tick fever been observed. On the only two recent occasions that Indian troops contrary to Standing Orders have sheltered in Persian serais forty-one and forty-six per cent of the men have become infected. This would seem to indicate that the Persian has an early acquired or an inherent natural immunity to this disease which is not enjoyed by the European or his comrade in arms the Indian. Perhaps the two most difficult conundrums to try and solve are:—

(1) The cause of the great variation in the Sharifabad cases and their relative resistance to salvarsan.

(2) Why, in the case of certain infections, notably in the Jinnuk outbreak, the temperature charts are all of the same type, show more definite spiky relapses, rigors, sweats and collapse are more common, debility and constitutional disturbance are more severe and spirochætes are more numerous or more readily found? Do these differences indicate the presence of more than one infection, possibly of the same group, or is it due to one infection being modified through being transmitted by a different species of carrier?

All the cases in the Jinnuk outbreak were absolutely free from lice. The later cases from Sharifabad showed a very light infestation, but as the earlier cases were free this can be ignored.

Then we have the statement of the serai keeper that the two species of ticks cause different types of fever. It is quite possible that this may be correct seeing that however prone the Persian may be to exaggeration he is usually fairly accurate when it comes to matters of common knowledge and everyday experience.

In the serai at Jinnuk both Ornithodorus and *Argas persicus* were present and all cases of fever contracted there were of the same type and reacted similarly to salvarsan. It is true that the outbreak occurred during the hot weather when the *Argas persicus* is more active. There is no doubt that all ticks do not equally convey infection seeing that thirty per cent of Nos. 15 and 16 platoons although bitten did not develop

the disease. In the case of the sick attendant seen at Sharifabad, only one gorged tick of the Ornithodorus species was found in his bedding but the number of bite lesions seen indicated that he had been bitten by more than one tick.

These differences also cannot be due to the number of tick bites, since in the Jinnuk outbreak the type of fever was the same whether the man had been bitten by three or fifteen ticks.

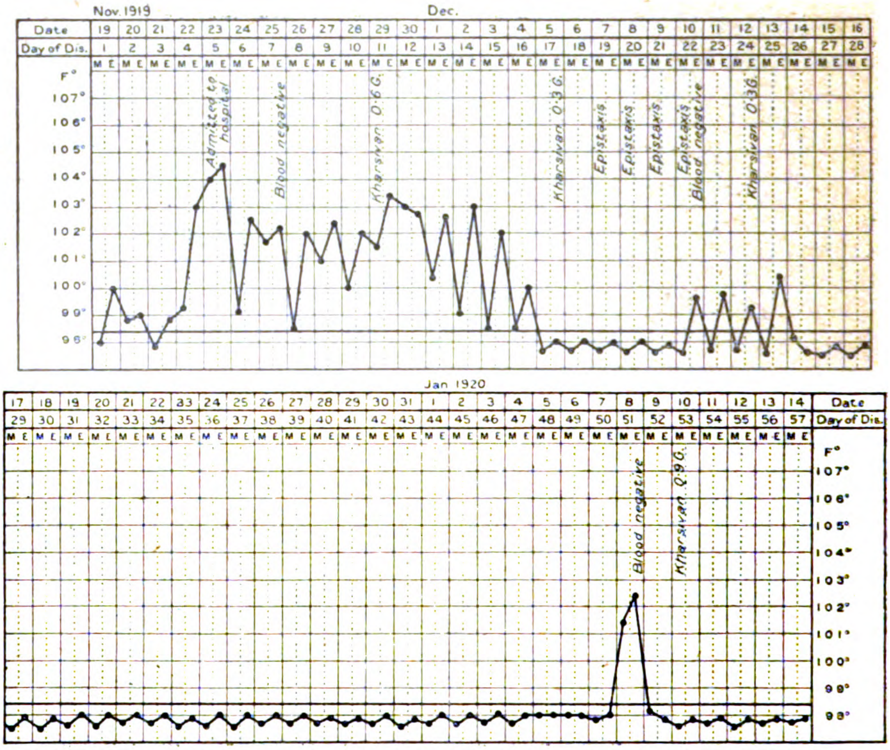


CHART IX.

In the groups of cases showing periods of a more continuous type of fever it is noticed that the fever tends frequently to become irregular and to produce a spiky type of chart. This continued fever is undoubtedly not due to a chest condition seeing that the majority of cases did not suffer from respiratory complications. It may be possible that the Jinnuk and "*a*" group cases are pure and that the other groups have a superadded infection which is resistant to salvarsan. The case previously quoted in group "*c*," Chart IV, in which spirochætes were eventually discovered during a spiky relapse and the fact that eighteen and nine per cent of positive cases are included in the groups "*c*" and "*g*" would appear to disprove this theory.

There is one theory which appeals to us as worthy of consideration, namely, that all cases at Jinnuk were bitten on one particular night only and this inoculation or group of inoculations gave rise to an infection which manifested itself eight days afterwards. The cases at Sharifabad were bitten on several different nights and it may therefore be presumed that these repeated inoculations might give rise to their individual infections on succeeding days and so alter the character of the disease.

In addition, as these different infections have each their own particular cycle various broods of parasites may not all be equally affected by a single injection of salvarsan.

Chart No. IX has been included because to our minds it seems to convey the impression that the patient was suffering from a succession of infections and these developing consecutively produced a chart representing a type of continued fever.

However, in the absence of proof, deductions can only be regarded as pure conjecture and apart from indicating a possible field for research are of very little value.

In consequence of efficient and prompt treatment, no case suffering from this disease has died or has been invalided from East Persia, but there is ample evidence to prove that casualties did occur in the past amongst foreign civilians prior to the introduction of arsenical compounds by us.

Finally, although tick fever in East Persia under existing conditions does not cause loss of life there is no doubt that it merits serious consideration, seeing that patients suffering from the disease remain in hospital for periods varying from twenty-three to seventy-seven days, thereby entailing a considerable loss to the State both in efficiency and money.

In conclusion, the writers of this note tender their apologies for the many defects both in it and also in the investigation. The difficulties will be readily understood when it is realized that the investigation was carried out under field-service conditions; there was no laboratory available; the line of communication upon which these cases occurred is approximately 700 miles in length and solely dependent upon a road traversing most difficult country, with inferior motor facilities.

The onset of winter, the hibernating season for ticks, and the hurried departure of H. D. W. before the investigation of the cases and the writing of this paper could be completed gave rise to additional complications. Another attempt at continuing this investigation is planned for the coming spring when it is hoped that more fruitful results will be obtained.

An acknowledgment of our indebtedness is due to Captain Haji, I.M.S., or the very material assistance rendered by placing the records of his cases at our disposal and also to the Director of the Agricultural Research Institute, Pusa, India, for so kindly identifying specimens sent to him.

NOTES ON THE ETIOLOGY OF AN OUTBREAK OF SCURVY IN NORTH RUSSIA, WITH AN EXPERIMENT IN TEST-DIETING.

By Captain A. G. STEVENSON.
Royal Army Medical Corps.

Scurvy broke out with severity amongst the inmates of the Russian civil prisons in Archangel in February and March, 1919, and the etiology of this outbreak is most interesting and conclusive from the point of view of the vitamine deficiency theory.

The prisoners were confined in the Archangel and Mcodiusky Island prisons under the charge of the Russian authorities and received similar rations while in confinement.

The scale of rationing in these prisons was as follows:—

From November, 1918.

Daily.	Flour (or biscuit)	11 oz.
	Rice, oatmeal, peas or beans (dried)	7½ ,,
	Meat or herring	7½ ,,
	Bacon or pork	1¾ ,,
	Tea	¼ ,,
	Sugar	1 ,,
	Salt	¾ ,,
	Lime-juice (preserved)	½ ,,

The meat was frozen or preserved and the herrings salt; the peas or beans were not germinated.

In May, 1919, the scale as above was altered to the following:—

Daily.	Flour	12 oz.
	Frozen meat (or ⅔ tin preserved meat)	10 ,,
	Oatmeal	2 ,,
	Peas or beans[1]	5½ ,,
	Fat	1 ,,
	Sugar	1 ,,
	Salt	½ ,,
	Lime juice (preserved)	1 ,,

[1] The peas or beans to be germinated.

From the above scales of rations the following facts are apparent:—

(1) The gross amount was deficient in quantity.

(2) No fresh foodstuffs were included.

(3) Preserved lime-juice was given daily to each man from half an ounce in November, 1918, to one ounce in May, 1919.

(4) Peas or beans were issued when available from November, 1918, but germination was not started until May, 1919.

(5) The vitamine content of the diet with reference to scurvy was extremely low, if not negligible.

Method of Germination and Cooking in the Prisons.

Germination when begun in May, 1919, was done most imperfectly, and no value could have accrued from the method in use.

Cooking consisted of throwing all the rations into a big boiler and allowing to simmer just below boiling point for upwards of three hours.

These methods would greatly assist in bringing the already low vitamine content of the diet to a vitamine-free condition.

On the above scales of rationing, it was not surprising to find scurvy breaking out with great severity in the late winter and early spring of 1919, and a large number of men developed this disease. On a visit to the Archangel prison in June, 1919, few, with the exception of newly arrived prisoners, were found to be free from active or incipient scurvy.

Over 300 of the worst cases were concentrated in a special hospital at Kegostroff Island, near Archangel, and this greatly facilitated the work of investigating their histories, with special reference to previous dieting, and also enabled test-dieting experiments to be carried out and the results noted.

Detailed histories were obtained from 200 well-marked cases, and the following points were noted:—

(1) All cases gave a history of liberal and varied diet, including fresh foods, *previous to arrest.*

A typical diet given was fresh meat, eggs, fish, potatoes and fresh milk. The fish was usually eaten raw, and the milk was unboiled. Other vegetables eaten were cabbage, radishes, cucumber and lettuce.

This diet would be quite adequate as regards vitamine content, and therefore at the date of arrest these men were well nourished and prepared against vitamine deficiency.

(2) On arrest, they were put into the Archangel and Moodiusky island prisons, and received similar diets.

Pre-Scorbutic Period.

Of these 200 cases, the average pre-scorbutic period, i.e., from the beginning of vitamine deficiency to the development of scorbutic signs and symptoms, was four to seven months.

The date of the commencement of vitamine deficiency was taken as the date of arrest, for the above-mentioned reasons. Considering the additional factors present, the general deficiency of the diet, the overcrowded and gloomy quarters, the lack of exercise and fresh air, and the degree of depression present consequent on their cheerless surroundings and on the uncertainty of their future, the period of four to seven months must have been considerably shortened, and I consider that under normal conditions, physical, moral and environmental, the probable period would be from five to seven months.

During this pre-scorbutic period various signs and symptoms are noticeable—lassitude, progressive debility, notable pallor and inability to

perform ordinary duties; and these give warning that the body tissues are beginning to react to the diet deficiency.

Effects of Previous Health.

In seventy-eight per cent of cases of rapid development of scurvy, i.e., a pre-scorbutic period of less than three months, a history of recent or associated disease was obtained. A large percentage of these had "typhus fever" in February, 1919 (not definitely diagnosed typhus, and more probably typhoid), and developed scurvy in conjunction with this.

Other associated diseases were dysentery and pneumonia.

Type of Case Present.

It is not intended in these notes to touch on the clinical aspect of this epidemic, but in the cases examined (200) the disease presented itself in various forms and stages, from milder cases with gum and skin changes only, to very severe types with extensive hæmorrhages, heart dilatation and the consequent sequelæ.

Summary.

(1) The whole history of this epidemic definitely bears out the "deficiency theory," and proves that scurvy is caused by the lack of the anti-scorbutic vitamine existing in fresh foods, i.e., fruit, vegetables and meat.

The ability to mark down the beginning of vitamine deficiency to the day when the unfortunate subject was imprisoned, and the knowledge that while in prison he was unable to supplement his vitamine-free prison ration with extras from outside, enabled one to calculate with a minimum of error the length of period before the signs and symptoms of scurvy presented themselves. This, under the conditions existent in this case, was four to seven months.

(2) Preserved limejuice, though given daily to all men from November 1918 onwards in the above-stated amounts, failed either to prevent the disease or to arrest it in those already affected, and can be considered of little value as a prophylactic against scurvy.

(3) Unfavourable environment and previous ill-health or intercurrent disease undoubtedly act as factors in the rapid development of the disease.

TEST-DIETING.

To determine the value in treatment of various known vitamine-containing foodstuffs, six groups of cases were selected, each group being of eight cases, all of a severe type of scurvy, and groups were made as nearly as possible identical as regards scorbutic condition.

All the cases selected had been in the special hospital at Kegostroff for from one to three months, but, apart from being in better quarters as regards light and air, were receiving the same rations as in the prisons with the exception of half a pint of boiled fresh milk daily.

Many of the cases showed recent hæmorrhages, and many were in a serious condition and unable to raise themselves out of bed.

A basal vitamine-free diet was given to all, and the vitamine to be tested was added to each group.

The following was the diet table :—

Group	Basal vitamine-free diet: 12 oz. bread	2 oz. oatmeal	1 oz. fat	10 oz. meat 8 hours boiling	2 pt. milk 1½ hours boiling	8 oz. ungerminated peas or beans 3 hours boiling	Test vitamine
"A" ..	+	+	+	+	+	+	Fresh lemon juice .. 4 oz.
"B" ..	+	+	+	+	+	0	Germinated peas .. 8 ,,
"C" ..	+	+	+	+	+	0	Germinated beans .. 8 ,,
"D" ..	+	+	+	0	+	+	Fresh meat .. .. 10 ,,
"E" ..	+	+	+	+	+	+	Tinned fruit .. 8 ,,
"F" ..	+	+	+	+	0	+	Lactic acid milk .. 2 pt.

The vitamine-containing foodstuffs in the basal diet were all well boiled before issue, to ensure this diet being as nearly as possible vitamine-free. The diets were made of approximately equal calorific value. The *test vitamines* were all carefully measured out before issue.

The lemon juice was squeezed out daily from fresh lemons. The peas and beans were germinated and cooked for half an hour only. The meat was roasted underdone. The milk unboiled was inoculated and kept for thirty-six hours, having then grown nearly solid.

The tests were continued for six weeks, careful clinical notes being taken twice weekly, and each case was weighed once a week.

Results.

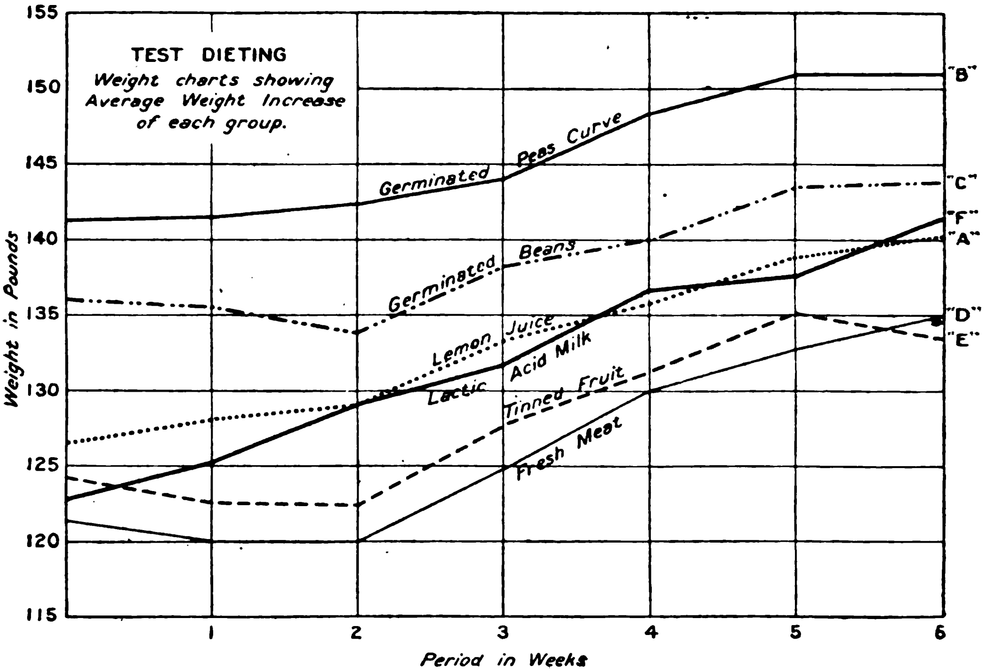
The results were looked for in the improvement of the gums, the increase in the appetite, the disappearance of the "earthy" complexion, the increase in the body weight, the ability to move the affected limbs freely and without pain, the improved vascular tone, and in the increase in in the morale.

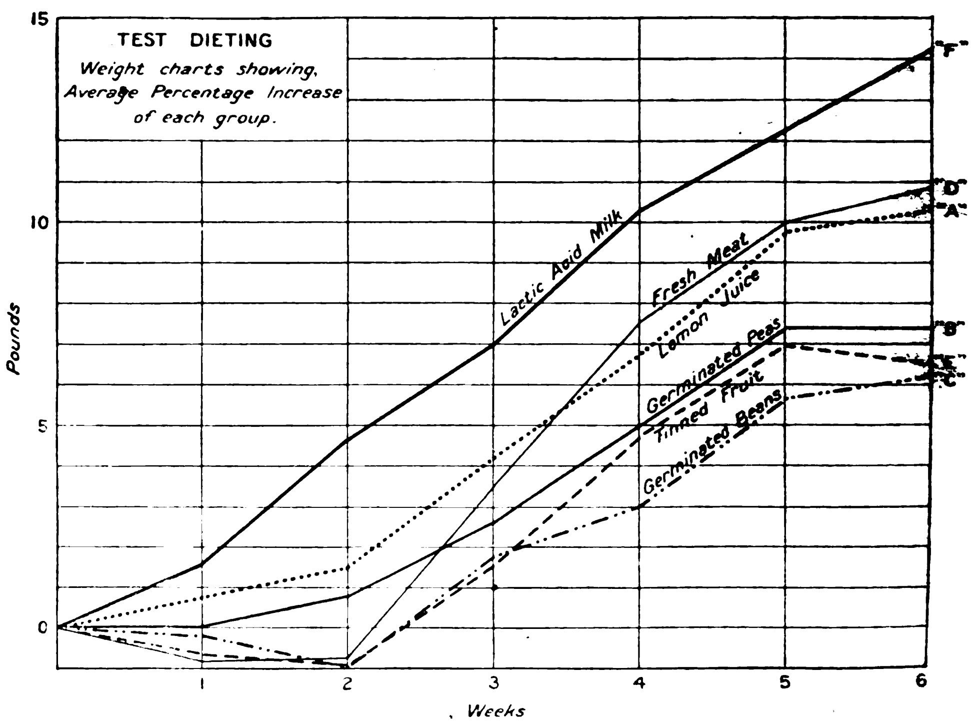
After six weeks' dieting, the following results were obtained :—

(1) All cases showed a marked improvement, and, with two exceptions, no new scorbutic signs appeared.

(2) The improvement was most marked in the lemon juice, lactic acid milk and germinated peas groups. In two weeks' time these groups looked better, felt better, and their body-weight graphs showed an increase.

(3) The germinated beans were inferior to the above, probably due to the digestive disturbances they caused. Complaints of pain to the affected gums while eating, indigestion and general distaste were frequent, and no variations in the cooking or method of serving, e.g., crushed or with milk or fat, seemed to improve matters.


TEST DIETING
Weight charts showing Average Weight Increase of each group.
155
150
145
140
135
130
125
120
115
Weight in Pounds
1
2
3
4
5
6
Period in Weeks
Germinated Peas Curve
Germinated Beans
Lemon Juice
Lactic Acid Milk
Tinned Fruit
Fresh Meat
"B"
"C"
"F"
"A"
"D"
"E"


TEST DIETING
Weight charts showing, Average Percentage Increase of each group.
15
10
5
0
Pounds
1
2
3
4
5
6
Weeks
Lactic Acid Milk
Fresh Meat
Lemon Juice
Germinated Peas
Tinned Fruit
Germinated Beans
"F"
"D"
"A"
"B"
"E"
"C"

The period of cooking (half an hour) still left them of a hard consistence, and longer periods of cooking do not seem to alter this.

Peas, on the other hand, were extremely palatable after half an hour's cooking, and no complaints about them were ever received from the patients.

(4) The general condition and the gums and hæmorrhages did not improve so rapidly on the meat and tinned fruit diets, though the body weights, after an initial fall for the first two weeks, showed a marked increase later.

(5) The group on lactic acid milk did extremely well, both as regards disappearance of scorbutic signs and body weight increase.

Ordinary fresh milk is known to have a low vitamine content. The anti-scorbutic vitamine seems to be increased in fermented milk.

Whether the addition of this lactic-acid product to the diet counteracts the effects of the toxic products of intestinal bacteria, markedly present in scurvy, and thus renders the absorption of the vitamine more rapid and to a greater extent, or whether the vitamine in milk is freed from some chemical compound by the katalytic action of the bacteria, is doubtful.

The former theory seems quite probable, especially as diarrhœa, which was frequently present in some cases, ceased first amongst the fermented-milk group. Lactic acid milk certainly warrants a further trial as a curative factor in scurvy.

It would be interesting, in the light of the success of the fermented fresh milk, to note the results in prevention and cure of fermented tinned milk, e.g., "Ideal."

CONCLUSIONS.

(1) The most rapid and efficient cure in scurvy is effected by the addition to the diet of vitamine-containing foodstuffs. Probably the best diet would be an ordinary full diet, with the addition of fresh lemon juice and lactic acid milk daily

(2) The germinated pulses have a high value. Germinated beans, though suitable for the prevention of the disease, are not suitable for cure, owing to their hard consistence.

(3) Fresh meat and tinned fruit have a distinct anti-scorbutic value.

(4) In curative properties, lemon juice is superior to the germinated pulses, though the latter, having the advantage of containing the vitamine along with important nutritive products, would act as a valuable addition to the daily ration as a prophylactic against scurvy when fresh foods are unobtainable.

In conclusion, I wish here to express my thanks to the medical authorities of the North Russian Expeditionary Force for the facilities given me during this investigation.

Much credit is due to Pte. (Acting Cpl.) E. W. Taylor, R.A.M.C., who supervised the germination, cooking and test-dieting throughout the whole period.

HINTS FOR NEWLY-APPOINTED STAFF OFFICERS.

By Colonel C. E. POLLOCK, C.B.E., D.S.O.
Army Medical Service.

When selected for a staff appointment for the first time a modest minded man is rather apt to feel at sea. His work is different to what he has been accustomed to and unless endowed with considerable self-assurance (which may not be an advantage in the long run) he will need some time to feel his feet. The following points, the result of experience, both as a staff officer and as an officer commanding unit, are offered for the guidance of beginners who are not above accepting them.

General Considerations.—A staff officer should possess some brains, the memory of a club hall porter, the temper of an angel with the patience of Job and the plodding perseverance of a Teuton. He should know his own job and that of every one else with whom he may have dealings. He must be prepared to work twenty-four hours on end and then receive a perhaps unmerited rebuke without retaliating or permitting it to upset his equanimity, to put up with his friends' advice as to how his job should be run and to ignore his enemies' criticisms; further, it is not permissible to show any outward signs of jubilation when he happens to get "one up" on a senior officer.

Whatever your qualifications it is well to remember that you have probably been selected for a staff appointment not on account of your brilliance, but merely because your chief thinks that you can be entrusted to carry on the routine work of the office and to relieve him of much spade work. Hence remember that the mere fact of getting a staff appointment does not justify the development of "swelled head"—let that wait till you have made good or even longer.

The tenure of your appointment has a fixed period and at the end of which you will have to rejoin the common herd and may then have cause to curse some brilliant innovation originated by you in a fit of exaltation. Especially beware of instituting new returns or periodical reports. Before doing so make quite sure that the information is not already being furnished in some other form. Each new return involves more or less clerical labour and expenditure in stationery and postage, not to mention bad language, and unholy prayers as to your ultimate fate.

Existing office procedure may be cumbersome but you must credit its authors with some common sense. Before assuming the rôle of "new broom" and introducing sweeping reforms you must think out very carefully what the results will be, which may prove to be much more far reaching than is apparent at first sight.

Be punctual in arriving at your office. If you are late in the morning

your staff will loyally follow your example and so will the work. Do your best to get all your trays cleared and to leave the office at or before closing time. After you have gone your staff have to register, address and despatch the papers you have signed, and your clerks usually know pleasanter ways of spending the evening than in getting off your belated correspondence. Never let papers accumulate, dealing with them does not become easier by incubation. Your job represents a necessary part in the mechanism of the army machine. If it does not function, the machine is held up or thrown out of gear. An exception can be made in the case of foolish correspondence which if left alone will answer itself.

After you have dealt with the morning's correspondence visitors should be welcomed and encouraged to talk shop in any form provided they are duly economical in the use of words. Unless the visitor is very artful or you are naturally obtuse he will in a short time permit you to gauge his qualifications and the way in which he does his job; his statements need not necessarily be accepted at his own valuation. You will also gain an insight into the morale and efficiency of his unit, a valuable asset to a staff officer. The visitor on his side may discover that you are not quite the malicious ass he had thought you to be and that however obscure and irritating the orders appearing over your signature still you were honestly trying to do your best within your limited abilities. When the interview has lasted a sufficient time, the period depending on the profit which you are deriving from it, you can politely point out that although you are holding a staff appointment you really have some work which you must get on with, much as you regret having to terminate the interesting conversation.

Official intercourse, written or verbal, does not preclude courtesy; on the contrary kindly consideration is generally reciprocated by better work. Deal lightly with first offenders, even staff officers make mistakes sometimes, while the hardened sinner will merely smile at abuse. A master "strafer" is born not made, although a certain degree of skill may be acquired by long practice. The "staff manner" may appeal to the officer who adopts it, but it is not generally appreciated by its victims. It may be permissible for a Bismarck to conduct official intercourse with studied rudeness, but imitations of his methods by mere ordinary mortals are not to be recommended.

Never sign a paper without first reading it. Typists make curious mistakes, sometimes involving awkward consequences for the officer who puts his name to the document.

Do not leave the drafting of minutes entirely to your clerk unless you are prepared to abdicate in his favour; he may be a better man than yourself, in which case by studying his compositions you may in course of time acquire the requisite knowledge to compose or at least intelligently to criticize his draft.

Remember that what you sign you are responsible for, no matter who drafted it.

Very few commanding officers write official letters merely because they think you are finding a difficulty in occupying yourself during office hours. When they ask for information it is because they want it and it is up to you to give or get it for them. Your billet gives you access to sources of information not open to them; make use of these.

Never play for safety in your replies. An old officer who once upon a time held an important staff position used to spend much time composing official replies, and after reading each over several times would say, "Now, whoever is going to be hanged for this it's not me," but he ought to have been. Make the best decision you can and state it boldly. You can better afford to be "strafed" than a commanding officer. Coloured tabs provide considerable immunity from the consequences of errors in judgment and other shortcomings. You are appointed and paid to take responsibility and if you won't you ought to make room for someone who will. Do not adopt the "don't let em 'ave it" habit. If anything is demanded and there are good reasons to support the request try to help the matter on. Few things damp zeal more than a feeling that it is useless to ask for anything.

The drafting of fool-proof orders and instructions is most difficult. To do so successfully you must have a fair acquaintance with the localities and personalities concerned, and a moderate knowledge of English. Without the first condition, your draft is certain to contain some foolishness. If you do not know the locality, go and visit it, or if the time does not permit of this, consult some one who does. If you do not possess the faculty of expressing your thoughts clearly, you will be unable to convey your chief's wishes. Nothing worries a commanding officer so much as missing his game of bridge because he had to spend the time in trying to puzzle out what your orders mean him to do. The orders should tell him exactly what is expected of him, but leave him to arrange the details in his own way, he can usually do so better than you. Also in writing your drafts it is well to remember that the English language does possess an elementary form of grammar and your compositions should show at least some slight acquaintance with it.

Apart from absolute routine work you will daily have a number of subjects to deal with, on each of which you must make up your mind to take up a definite line of action. Each question in general resembles a bridge hand except that you may have no partner and an unknown number of potential critics, while the rules and conventions of the game are many and complicated, and finally your decisions are recorded in writing, so that you are liable to be confronted with them on some possibly highly inconvenient future occasion. Just as in bridge, the hand dealt you can be played in a variety of ways, but only one of which will give you the best return, so in dealing with the problems reaching the office there is only

one line of action which really meets the case and it is up to you to find it —not always an easy task. Other lines of action, especially those allowed to be influenced by personal likes or dislikes, are unsatisfactory and may even entail penalties in some form. If you can hit off the best solution in two out of every five subjects you may be quite satisfied.

A staff officer's primary duty is to help everyone and everything all the time, if you fail to do this all else counts for naught.

Deal straightly, honestly and speedily with all men and matters; if you do, success, respect and possibly honours will come to you without being sought for.

A staff appointment exacts much, and often returns little.

Clinical and other Notes.

DISINFESTATION IN THE GERMAN ARMY IN THE WAR.

By Captain A. G. G. THOMPSON.
Royal Army Medical Corps.

In order to give a clear idea of the way in which the Germans ran their delousing schemes, etc., it will be necessary to give first a brief outline of the ordinary medical arrangements for an army in the line.

Corresponding to our D.M.S. Army was the Armeearzt who had as a sanitary advisor some very well-known hygienist, as a rule. In the army were a number of corps each with a Korpsarzt corresponding to our D.D.M.S. Corps.

The Korpsarzt had attached to his staff a sanitary advisor who ran the whole of sanitation for the corps headquarters and the three or more divisions of which the corps were composed. Each division in turn had a Divisionsarzt corresponding to our A.D.M.S. division, but there was no sanitary advisor attached to his staff, nor were there any units corresponding to our sanitary sections attached to the divisions.

Each division consisted of three regiments, all of which were in the line together, and each regiment had four medical officers, one to each of the three battalions and one the senior regimental medical officer attached to the regimental headquarters.

Each of the four companies in a battalion had in the front line a medical non-commissioned officer and one or two medical orderlies who were responsible for the conveyance of the wounded to the battalion medical dug-out, where they were patched up, etc., by the battalion medical officer and his staff, which consisted of a medical non-commissioned officer and one or two medical orderlies. From the battalion dug-out in the third line the wounded were conveyed to the regimental dug-out, generally one to three kilometres behind the front line. Here the regimental medical officer had a staff of—a serjeant, a corporal, and several orderlies of the Medical Service and this apparently was neither an aid post nor an advanced dressing station but something in between the two. This dug-out was emptied periodically by motor ambulances belonging to the Sanitäts-Company which consisted of:—

1 Commanding officer (major, non medical).
8 Medical officers.
1 Serjeant-major.
1 Serjeant.
18 Non-commissioned officers (corporals).
16 Lance-corporals, including 1 tailor, 3 bootmakers, 1 wheelwright, 2 blacksmiths, 2 cooks.
206 Men (orderlies).
1 Cyclist.

and was situated well behind the line, some ten kilometres or more. This was a divisional unit and collected from all the three regimental dug-outs. Only urgent operations were performed here and dressings renewed when necessary.

This unit corresponds to our field ambulance.

The cases from here were evacuated by train, or light railway to the two Feldlazaretts, which were situated twenty-five kilometres or more behind the line in a church or school, and were closely allied to our casualty clearing stations. Their personnel was not fixed but depended entirely on the number of beds, etc. From here the wounded were evacuated right back into Germany if serious cases, while if slight they were retained until fit and then returned to duty direct.

Under ordinary circumstances the divisions were relieved every fourteen days and then went back into billets in villages. In one of these was built for the division a bath and delousing apparatus, which was run by the town major's staff and he was responsible for its smooth running; the corps sanitary officer was responsible for all other arrangements, except the actual working, such as time tables for the baths and other similar external work.

The bathing and delousing were both done in the same building and appear to be far more simple than our methods (see plan).

Any convenient sized room already existing was used, or an entirely new place built depending upon the resources available. In the centre of this room was erected a hot air disinfector. This was really a large wooden box with doors at each end; there were two or at most three rails across the roof on the under side which could be pulled out on either side when the doors were opened for loading and unloading purposes. The heating of both the bath water and the disinfector came from the same fire; the disinfector itself was heated by means of radiators on the superheated steam principle as a rule, but braziers were also used as in plan 2.

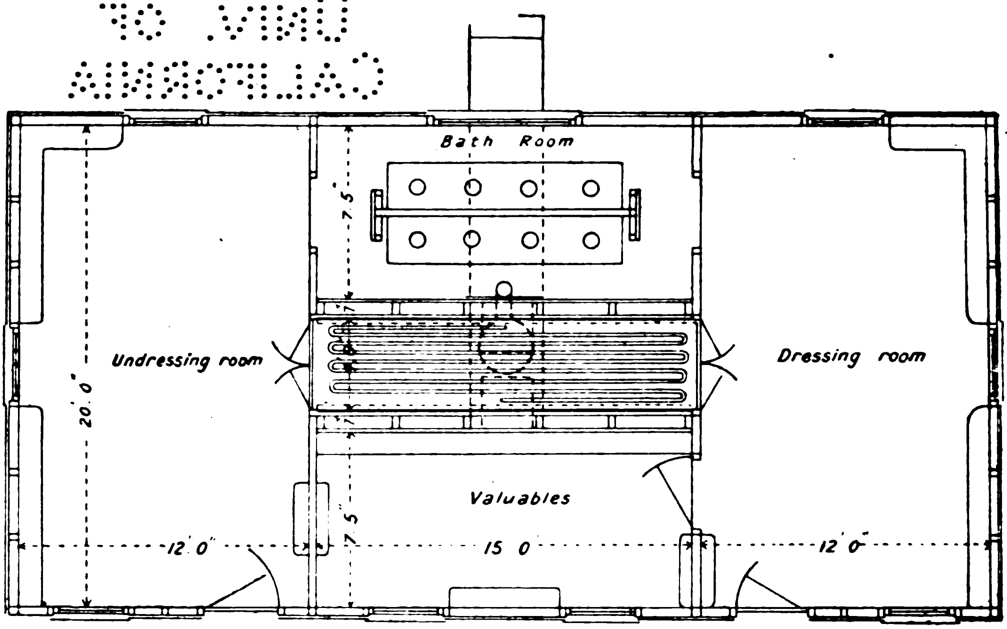
These baths were capable of dealing with varying numbers of men, depending on the size of the original room; a large one at Cambrai passed 3,000 men per diem and smaller ones were constructed to take one battalion a day.

The mode of working was as follows: 100 men, for example, would arrive at the entrance door and would file into the first room. Boots and valuables were first passed into the cloak-room and either put on small shelves or hung on hooks in "dolly bags." Each soldier was told what was the number of his ticket and then he stripped off every other garment. These were hung by himself under the supervision of one or two fatigue orderlies on a hanger much like those upon which coats are hung in wardrobes, only there was a hook at each end as in the figure. The jacket was hung on one side, trousers on the other, and the socks, shirt, etc., thrown over the centre portion. When the rails were fully loaded they were pushed home and the door of the disinfector shut. The men then went into the bathroom, where there was an ample supply of water from sprays and which was also heated by radiators as also was the dressing-room at the far end.

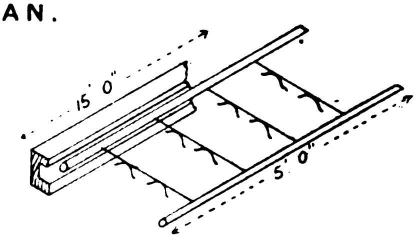
The clothing was left in the disinfector at a temperature of 100° C. dry heat for one hour. The door into the drying room was then opened, and each man received his own clothing, which he put on. He repeated his own number to the cloak room attendant, and obtained his boots and valuables and then walked out, having been completely disinfected. There was no means of disinfecting his blankets at the same place, so these went to the laundry which was usually quite close and were there ironed.

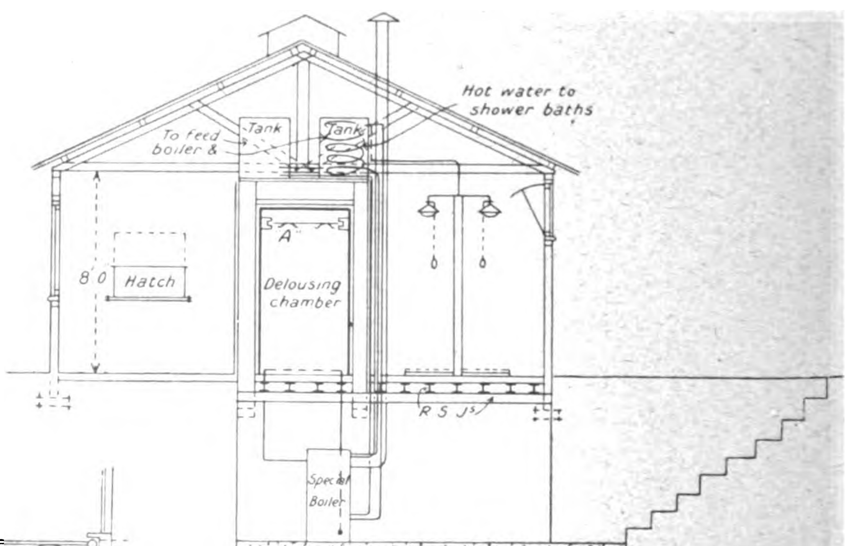
There were several other types of disinfector worked on the hot air principle,

PLAN I.—Combined Bathroom and Delouser. (Scale ⅛ inch = 1 foot.)

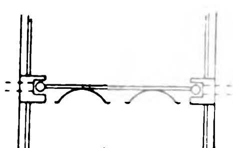


PLAN.





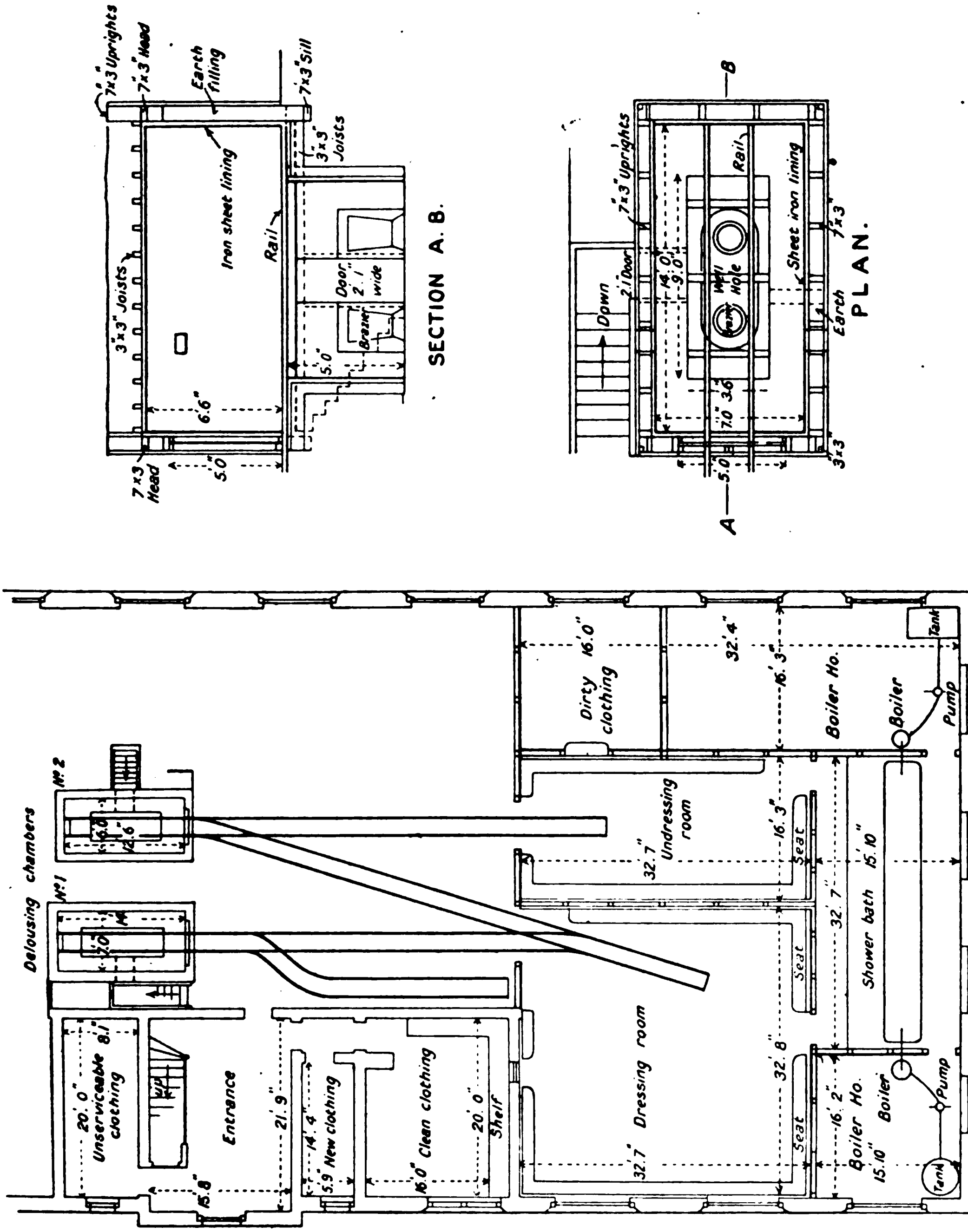
SECTION.



"A"

"A"—Rack for hanging clothes (5 feet long). This must be fixed so as to allow rack to be drawn out when the doors are open. A pulley attached to door head (inside) with wire running to rack would enable rack to be drawn out (same applies at other end).

PLAN II.—Bath House and Delousing Chamber.



Scale ¼ inch = 1 foot.

Scale $\frac{1}{16}$ inch = 1 foot.

but the type above was standardized as far as possible and towards the end of the war practically no other types were being erected.

Further back from the line the clothes were baked for two hours at 80° C. as this was found to give better results and was less likely to damage the clothing. The shorter time at 100° C. was found to be sufficiently efficacious nearer the line, where speed in passing clothes through was essential.

In Germany itself hydrocyanic acid gas was experimentally used where vast quantities of lousy clothing were returned for renovation and reissue. There were a number of deaths among the orderlies working with this gas and its use was prohibited anywhere in the line.

In Douai there was an experimental disinfector worked with dry heat and sulphur dioxide together, but this method was never in general use.

There were steam wagon disinfectors working on much the same principle as the horse-drawn Thresh but these were not capable of dealing with sufficient quantities of clothing for them to be very useful. The Sanitäts Company often had one, but as a rule all soiled hospital clothing went to the laundry for disinfection.

As a prophylactic crude naphthalene was issued at first, but the men found that it irritated the skin too much. A half and half mixture of powdered talc and naphthalene was afterwards issued, but this was too strong and was never in general use. Scabies was apparently not the cause of as great a sick wastage as it was with us. Wards of scabies cases were opened in every Feldlazarett when necessary and the treatment consisted of baths and an ointment of balsam of Peru, styrax and a proprietory medicine called pernol were used later on when the supplies of balsam of Peru gave out. In the last stages of the war soft potassium soap was used only, as there were no other materials available.

Plan No. 2 speaks for itself. It is that of the bath house and disinfector built in the most modern barracks, but is hardly applicable to an army in the field. The use of braziers was just as common in the type of disinfector described for an army in the field but was replaced by radiators, as being less liable to cause a fire, whenever possible.

NOTES ON EARLY SCURVY.

By Captain A. L. SHEPPARD.
Indian Medical Service.

The following notes, which were circulated in the Mesopotamia Expeditionary Force, were written in October, 1916, while I was in charge of a scurvy convalescent camp, as a guide to the diagnosis of early cases. They may now be of general interest, as there have been a number of communications on the subject published recently.

I.—Signs and Symptoms.

(1) *Gums.*—(*a*) In scurvy the condition commences as a soft swolling sprouting up between the teeth. Later on at the apices of these, red "buds" appear apparently pushing through the mucous membrane. Lastly, these "buds" become "blossoms," like an opening rose. The "blossoms" unite and

show ulcerations and hæmorrhages. The whole gum becomes swollen and in extreme cases all the teeth may become loose. Typical gums are often first seen round the molar teeth only, or around carious stumps or on both the palatal and buccal sides of the alveolus. About twenty per cent of undoubted scurvy cases show no gum signs till quite late, in some cases they never show such signs at all. Some Indians have pigmented gums and palates and pigmented patches on the margins of the tongue. These have no connexion with scurvy. Very early scurvy gums often show a "rolled" edge, running across which fine parallel clawlike striations may be seen. This is never due to pyorrhœa.

(*b*) *In Pyorrhœa Alveolaris.*—The early stages show slight swelling followed by an eating away of the margins of the gum. These changes occur over the teeth and not between them, as in scurvy. The later stages are characterized by marked shrinking of the gums over the teeth, whereby the roots are exposed encrusted with tartar. In either stage pus may be squeezed from between the gums and the teeth. This condition is almost confined to the region of the lower incisors and canines. Occasionally cases of pyorrhœa show hypertrophy of the margins of the gums. In these cases the gums are fairly hard and between them and the teeth lies a trough of pus. Scurvy and pyorrhœa are distinct diseases. They may possibly occur simultaneously, but the one does not necessarily predispose to the other.

(2) *Pain* is probably due to early stretching of the tissues and commonly presages œdema or hæmorrhages. Cases complaining of pain only and not showing signs in the gums should not be sent to the scurvy camp. Pain may be due to other causes, such as old trench feet, rheumatism, or neuritis. In any case, if the pain is due to scurvy, definite signs will be visible in a few days.

(3) *Œdema.*—This occasionally starts round the tendo Achillis in one foot; it then spreads to the region of the malleoli and the dorsum of the foot. It is best detected by examining both feet from behind from a short distance.

(4) *Hæmorrhage.*—Hæmorrhages may occur anywhere in the body, and may be the first sign of scurvy.

(*a*) *Petechial.*—These occur chiefly round the hair follicles of the thigh, and are a very early sign. This must not be confused with the rash of pediculosis, which does not occur round the hair follicles.

(*b*) *Muscular.*—This is most marked where there is most work. In cavalrymen it occurs in the adductors and in the popliteal space; in infantrymen in the calves of the legs and in the extensors of the thigh. It is best detected by comparative measurements. It may be mistaken in isolated cases for sarcoma or gumma. It is common in spaces such as the popliteal space, and around the knee joint, and is caused by effused blood running along the line of least resistance. Joint movements are smooth and free, except when mechanically impeded by a large hæmorrhage. This will distinguish it from rheumatism.

(*c*) *Sub-periosteal.*—This occurs most commonly along the front of the tibia and is very painful.

(*d*) *At the Junctions of Bone and Cartilage.*—This is fairly common over the lower ribs. Here it forms the "scurvy rosary," which is tender on pressure This is usually a late sign.

(5) *Other Signs and Symptoms.*—Anæmic, hæmic murmurs, night blindness,

general œdema, and intestinal hæmorrhages. These are all late manifestations as a rule. The last two are extremely serious. Many advanced cases have a temperature of 101° or 102°.

II.—Examination for Scurvy.

The mouth should be carefully examined, especially the molar region and the palatal side of the alveolus. Look for early scurvy "buds." Examine the thighs for follicular hæmorrhages. Examine the legs for muscular hæmorrhages, especially around the knee. Compare the measurements of the circumferences of the two limbs. Examine the ankles from behind for the detection of early œdema. Do not diagnose a case of scurvy merely because the man complains of pain. Look for swellings, and if these are found decide whether they are due to scurvy. If no swellings are found keep the case under observation in case swellings occur later. (See the last sentence of para. I (2)).

Certain extracts from a report I wrote after the closing of the camp may be of interest.

Total number evacuated	292
Clinical Data.	
Gums—Bad	106
Slight	131
Very slight and normal	55
Hæmorrhages: –	
Thigh	35
Popliteal	16
Legs	29
Knee region	22
Sub-periosteal	23
Follicular	28
"Scurvy Rosary" (slight)	10
Œdema of ankles	178
(There is reason to suspect that the last figure is too high.)	
Men with less than four months' service in the country	15

Diets.—Equally severe and similar cases were tried on six ounces of skinned raw potatoes, and four ounces of special lime juice[1] respectively. Those on potatoes improved remarkably; out of all comparison to the men on lime juice.

Yeast—This was tried on twenty-five men, but proved quite useless.

Fresh Limes.—These appeared to be of some value.

Germinated Peas, etc.—These were not tried in the camp, as at that time their value was not known to me.

———

[1] Prepared from fresh tissues, and with five per cent of alcohol and salicylic acid, two grains to one pint as recomended by Willcox.

To illustrate "A Case of Acromegaly," by Captain T. O. Thompson, R.A.M.C.

A CASE OF ACROMEGALY SHOWING ENLARGEMENT OF THE PITUITARY FOSSA AND GIVING A SHORT HISTORY OF ONSET.

CAPTAIN BY T. O. THOMPSON.
Royal Army Medical Corps.

PTE. T. B., aged 25, service 4½ years. Admitted to Hospital, Bangalore, May, 1919, complaining of loss of vision of the left eye for nine months.

History.—

Family History.—No trace of any condition resembling acromegaly or bearing on the disease in any way.

Past Medical History.—No illness of any kind, which he can remember, before joining the Army.

Present Medical History.—Sand-fly fever, August, 1917, in Mesopotamia.

In August, 1918, he had a very severe attack of diarrhœa in Mesopotamia, during which on August 3 he had a very bad headache which lasted about one week.

He was sent to see the eye specialist, and attended three or four days, but nothing more was done. He has had the bad headaches eight times since then. There is a very slight ache present at other times. The headaches are very severe spasms of pain, mostly frontal, lasting about four minutes. The loss of vision occurred when the headaches first started, and has been getting worse lately.

On Admission.—Heavily built type of man complaining of loss of vision of left eye.

Eyes.—Right eye, good reaction to light. Left eye, practically no reaction to light; eye movements appear normal. Pupils, equal and regular.

Eye Specialist's Report.—Primary atrophy of the left eye with complete loss of reaction to light on temporal side and slight reaction on nasal side. Right eye vision $\frac{6}{18}$, no atrophy, and field appears normal.

Respiratory System appears normal; no obvious enlargement of either the thyroid or thymus gland found.

Circulatory System appears normal. Pulse is slow, soft and regular. Heart, nothing adventitious found.

Alimentary System normal, appetite good; bowels regular. Teeth excellent, few missing.

Urinary System.—Has never noticed himself being puffy or swollen, and has not noticed any swelling of hands or feet. Has never had any urinary trouble. Occasionally gets a slight pain in the left lumbar region unaffected by movement. Has never had any hæmaturia or renal colic. Testicles appear normal.

Urine.—Contains albumin ¼ per cent. No casts, no sugar.

Central Nervous System.—No apparent change noticed in speech or hearing. He is of average intelligence, and appears to have no mental defects.

Cranial Nerves.—First nerve: He states definitely that he considers that he cannot smell so well as before. Second nerve: See eye specialist's report. Third and fourth nerves appear normal. Fifth nerve: Complains of pain over the frontal regions on both sides when the headache is present, and also in the left temporal region. No special hyperæsthesia or anæsthesia over emerging branches. Sixth nerve appears normal. Seventh nerve: Slight asymmetry of face on movement of grinning. Eighth nerve: Hearing good and appears equal

on both sides. Abdominal reflexes normal. Knee jerks normal. Elbow jerks normal. Plantar reflexes normal. No ankle clonus. No spastic or paralytic condition or wasting of any muscle found.

X-Ray Examination (see attached photograph).—Lateral view shows marked enlargement of pituitary fossa. The bones of the skull are somewhat thicker and more massive than normal. The actual measurements of the fossa on the plate are twenty-two millimetres antero-posteriorly, twelve millimetres vertically. The appearance suggests that the pituitary fossa is enlarged by a cyst and has pressed on the left side of the optic tract. The actual outline of the bony portion of the fossa is perfectly clear, which seems to point to absence of any invading neoplasm.

Hands and Feet.—The hands and feet are both rather large and massive-looking but the patient had not himself noticed anything until his attention had been drawn to them. His boots had become tighter but he had not had to change the size. In the standing position his fingers hung to within three inches of the knee-joint.

His general appearance is one of heavy build and large bones without any very definitely marked point to go upon. Comparison with an old photograph showed this. As can be seen from the X-ray the jaw is large and solid. As nothing definite could be done for the man here, he was invalided with a view to possible operative treatment in England.

The case appeared to be of interest for the following points :—

(1) *The Sudden Onset.*—This appears to be absolutely definite and to coincide with an attack of acute diarrhœa. The age incidence is the normal one and the onset is often associated with some definite illness such as in this case. The type of illness appears to vary and presumably a condition of generally lowered metabolism may lead to lack of certain essential salts causing a final upset in the metabolism of the pituitary gland and an abnormal secretion of the anterior part.

(2) *The Prognosis and Possible Treatment.*—No attempt was made to treat with glandular extracts as no certain results appear to have been obtained. As regards operative treatment the earliness of the condition and the small present local change suggest the possibility of cure, but as these cases may live in comparative comfort many years it seemed that symptomatic treatment would be the best.

ACUTE MENINGITIS OF UNCERTAIN ORIGIN.

By Lieutenant-Colonel J. L. WOOD.
Royal Army Medical Corps.

This short paper was written at the request of Sir John Rose Bradford, who very kindly took an interest in a number of cases which passed through the hands of several medical officers of the local Isolation Hospital.

As the last of these medical officers, I have embodied their observations in this note. The histories and temperature charts of all these cases have been kept and I believe they were aborted cases of cerebrospinal fever. The cases all came under our observation as suspected cerebrospinal fever; they were characterized by a sudden onset of severe headache not necessarily frontal or occipital; vomiting, a stiff neck, a positive Kernig, pyrexia of varying degree—usually brief, slow pulse,

furred tongue, no rash, no herpes, no disturbances of the sensory or motor nerves, no difficulty of micturition. The positive signs and symptoms were marked and did not differ from those seen in cerebrospinal fever, except with regard to Kernig sign; in this the locking of the knee-joints seemed rather of an elastic nature, than the rigidity of ankylosis. On lumbar puncture, there was a ready flow of clear limpid fluid under considerable pressure, and 60, 80 or 100 cubic centimetres was not an unusual quantity to draw off. The character of the fluid reminded one of gin, and we always called these cases "gin-clear" meningitis. The name "gin-clear" is always applied by fishermen to the crystal clearness of a north-country trout stream in August drought. The fluid in tubercular meningitis cases has been called clear, but it is a muddy fluid compared to that I have described. The cell elements in the fluid were very few and indicated nothing; all cultures, aerobic and anaerobic, failed. Only on very rare occasions did the fluid reduce Fehling's solution, or decolorize potassium permanganate solution.

The effect of lumbar puncture was to alleviate the headache directly, and in no case was it required more than three times, and in every case the patient recovered—I am sure *post hoc*, not *propter hoc*.

It is of interest to note that after chloroform these cases vomited, the cerebrospinal fever cases did not. The cases never showed the presence of a meningococcus in the posterior nares and agglutinins for meningococci were not present in the blood; Captain Wilson, who did a lot of work on the immunity reactions of some of the cases, found no scientific grounds for regarding them as meningococcal infections.

The cases did not resemble trench fever and were not meningitis or meningismus associated with any of the enteric group, as far as we could prove by blood culture and agglutination tests.

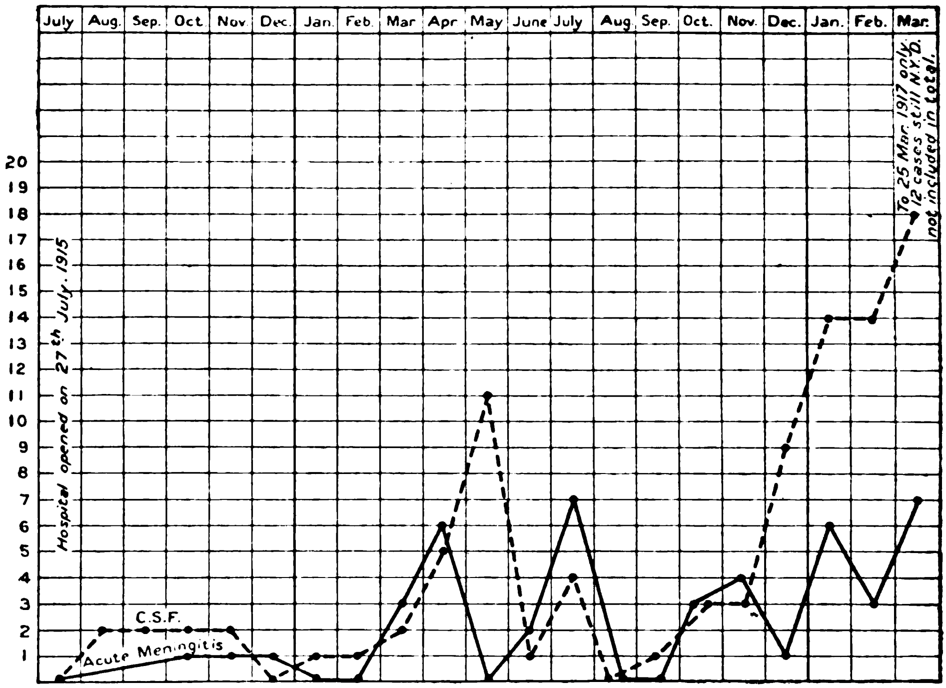
Martin Flack, in his report on the cases seen by him in 1915, in London, found thirty-three per cent had a clear cerebrospinal fluid—and of these two-thirds gave no growth of coccus—but he obtained a growth from the nasopharynx; indeed in every case, except one, where this procedure was adopted the coccus was found. All his "clear fluid" cases recovered except one, of whom there are no further details.

In the Local Government Board Report on cerebrospinal fever for 1916, Dr. Bruce Low reports on the prevalence and distribution of cerebrospinal meningitis during recent years. He speaks of many small epidemics in which no bacteriological work was done; he then goes on to describe an outbreak at Irthlingborough in Northamptonshire:—

"An outbreak, comprising about thirty marked cases, at Irthlingborough, a small town in Northamptonshire, was brought to the notice of the Local Government Board in 1905. There were also in this instance, co-incidentally with the unequivocal cases, several others of anomalous sort, most among persons who had been in direct contact with one or other of the patients who were seriously ill. These anomalous cases resembled acute influenza, and all recovered. In this outbreak resort was had to bacteriological investigation, which was conducted on behalf of the Board by an expert, Dr. Mervyn Gordon, who found in the nasal mucus, or in the cerebrospinal fluid, the meningococcus of Weichselbaum; so that the diagnosis of cerebrospinal fever was established beyond dispute. This is the more interesting from the fact that the serious cases and those with only

influenza-like symptoms, occurred side by side, both classes of cases being apparently due to the same meningococcal infection."

I regard my cases as aborted cases of cerebrospinal fever because in the first place they looked the part clinically, and apparently appeared so to other observers, who sent them to us. In the second place the incidence of these cases synchronized with the incidence of cerebrospinal fever, as is shown in the accompanying charts. One hypothesis would be that these are aborted attacks in which there is toxæmia—either with or without septicæmia, probably without. The toxæmia produces all the common physical signs. That these are due to the toxæmia is borne out by their occurrence in fulminating cases, with very slight meningeal involvement, and in pneumonia with meningism.



ADMISSIONS DURING 1915-16 FOR ACUTE CASES OF CEREBROSPINAL FEVER AND ACUTE MENINGITIS.
(C.S.F. "carriers" not included. Convalescent cases from Front excluded).

A case of meningitis with pus may give a "gin-clear" fluid on lumbar puncture. I had a case of pneumococcal meningitis, which died after three "gin-clear" punctures had been done. Post-mortem, the base of the brain was covered with a thick yellow pus containing pneumococci. Until the post-mortem findings I had thought that at last a "gin-clear" case had died and we might get some positive evidence of the state of the brain, but in this we were still disappointed.

Travel.

IN THE HIGHLANDS OF ALBANIA.

By Captain J. K. GAUNT.
Royal Army Medical Corps.

As Albania has been somewhat in the limelight of European politics of late, the following account of a trip I was fortunate enough to make into the interior of Northern Albania might be of interest.

As everybody knows, this country was one of the possessions lost by Turkey during the last Balkan War, and its boundaries were advanced in favour of the Balkan Allies on the north, east and south. Thus certain tribes became automatically subjects of the Balkan Allies to which they strongly objected, and the inevitable insurrection took place; Servia for her part retaliated by burning the villages and taking the food and flocks of some truculent Mohammedan Albanian tribes in the Krasnichi district, north-west of Jacova, and the refugees to the number of some 4,000 made their way to Scutari about the middle of October, 1913.

The addition of these desolate people naturally proved a strain on the resources of the town. They had also, according to some reports, come into conflict with Albanian tribes through whose districts they had passed on the way.

In consequence, Captain S. G. Francis, D.S.O., 2nd West Yorkshire Regiment, Commanding Albanian Gendarmerie, was detailed to make a reconnaisance in these districts, and to ascertain the real state of affairs, and the writer was selected to accompany him to report on matters from a medical point of view generally.

Before starting this rough sketch of our adventures it would be as well to give a short account of the country, its people, and some of their customs.

Northern Albania is very mountainous and rugged, there being very little level country anywhere once one has forsaken the shores of the beautiful Lake Scutari. Much of the interior has never been even roughly surveyed, and the one and only available map is incorrect in a number of instances; one village, Thethi, was found to be placed in the wrong valley. The altitudes of many mountain peaks have not yet been recorded, and the roads, or rather tracks, are not to be relied upon when consulting the map. From which it will be seen that this is a part of the world not much frequented by the tourist, in fact we appear to have been the only Englishmen seen in these villages "within the memory of the oldest inhabitant."

Many districts are shut in by snow during the winter, and often for

four or five months no communication is possible with the outer world. Snow is frequently many feet in depth, and when its surface hardens the natives get about with the aid of flat strips of wood attached to their shoes. The hay harvested during the summer is stacked around a pole some four feet clear of the ground, the small ricks resembling in the distance neatly trimmed holly trees.

The villages generally speaking are a very scattered collection of substantially built stone houses, and wicker-work cottages or huts, each having its plot of land, which is either under cultivation in maize, wheat or tobacco, or given up to pasture.

The flocks consist chiefly of goats and sheep with a few cows.

The principal tribes, collectively known as the Mallisores or Albanian Highlanders, are the Hotti-Gruda-Kastrati-Shkreli and Kelmenthi, together with the Krasnichi and Shala, the two latter being the ones whose districts we hoped to visit. Each is ruled over by an hereditary chief who may have as many as 400 families under his charge.

The spiritual welfare of the Christian natives is looked after by a Franciscan priest, who has great influence with them; in fact he is at the same time their Solomon and St. Luke. His life much resembles that of a country practitioner; at any moment of the day or night in any weather he may have to ride out to some member of his flock, far distant perhaps, to give either extreme unction or render medical aid; for there is no doctor in such remote parts, any ailing native being at the mercy of what slight medical knowledge the good priest may possess, or of some member of the community who comes to the help of his sick friend with an infusion of some special leaves perhaps, which he obtains from some plant in the neighbourhood.

The people generally speaking live on the land, the womenfolk especially working hard, in fact they appear to do the greater part of all manual labour, which has a tendency to spoil what are otherwise quite good and regular features. The men are a spare, active, well-built lot, a stout man is rarely seen. The hair of the head is closely shorn with the exception of a long tuft called "perchin" which varies in shape and position according to the district the man comes from.

The clothes are made of a strong, thick, white woollen material, home-spun. The trousers are heavily braided and the distribution of this braid is a distinguishing tribal mark. In winter time shaggy sheepskin coats are pretty generally worn, in addition very often to a large hooded woollen cloak. The shoes, of those who wear them, consist of a piece of stout hide roughly fashioned and strapped on over a pair or even two pairs of thick home-made woollen socks which the womenfolk knit as they amble along to market. Thus shod, long distances can be covered over rough ground without any sign of foot soreness.

The food consists largely of maize and goat cheese, meat not figuring in the menu to any large extent. In this connection it is interesting to

note, in support of the generally accepted statement that pellagra and maize diet are not related, that I was unable to discover any cases of this disease in the country.

The morals are believed to be good, the rifle, universally carried by every male from fifteen years of age upwards, exerting a strong influence in that direction. The marriage laws are interesting; betrothal takes place by parental arrangement during childhood; if when the time for carrying out the contract arrives the girl does not wish to accept her betrothed then she is not compelled to do so, but on the other hand must remain single the rest of her life. If it is the man who refuses to complete the bargain then the lady's relatives are allowed the privilege of shooting him together with any and every member of his family if the opportunity presents itself.

As might be expected superstition is well to the fore; chains of coins are worn on the heads of infants and even placed on cattle for the purpose of keeping away the "Evil One." A sheep's scapula is "read" by holding it up to the light of a log fire, and according as to whether the bone appears clear or cloudy so will the events of the near future be propitious or otherwise.

Blood feuds are general and the natives of one village at least are prevented from entering Scutari except by a very circuitous route owing to the fact that a vendetta exists between them and a neighbouring tribe. We were told a rule of the vendetta was that the man whose life happened to be at stake was always safeguarded as long as he was accompanied by another man or woman. We came across one victim of the Shala tribe who had been shot clean through the head whilst resting on a bank; at first sight he appeared to be sleeping but the large exit wound in the right mastoid region soon dispelled the illusion.

However, this particular rule in the etiquette of the vendetta does not invariably appear to be adherred to; for one evening as some members of the Shala tribe were sitting around a camp fire, distant a couple of hours' journey from Scutari away on the plain of Stoi, they were murderously attacked by several members of the Krasnichi tribe with whom they were then "at blood." These latter crept up under cover of darkness and fired point blank into the group. Four of the victims were seen next day; one man with the back of his head blown off, the tattooing around the entrance wound in the face testifying to the closeness of the range—a second man with an exit wound in the back of his neck—a girl with the jaw badly shattered and also a large exit wound in the left iliac fossa, and last but not least an old woman; her head was bashed in, presumably with the butt-end of a rifle, and the abdomen ripped up for some six inches.

The relatives of these people appear to have had their revenge a few evenings later when they crept up to a ramshackle hut occupied by a family of Krasnichi refugees on the outskirts of the town; firing through the windows, two killed and six severely wounded (women and children

included) were accounted for, the assailants of course slipping away never to be caught in spite of the fact that a military patrol was on the spot within two minutes.

Turning now to the trip itself. Our party all mounted and fully armed was made up as follows—five Albanian gendarmes, a Montenegrin man cook, an Albanian French-speaking interpreter and a transport driver. The transport consisted of three pack ponies carrying our Wolseley valises and spare provisions in which army biscuit and chocolate figured prominently.

A small quantity of medical and surgical stores was also carried.

In addition came with us under our protection an elderly white-bearded American named W. Willard Howard, secretary to a Philanthropic Society in New York which has raised large sums of money in the past for refugees in Armenia, Cuba, and for the Turks during the late war. His mission was to take cinematograph pictures of the refugees and their devastated houses which were to be exhibited all over the United States of America in churches and public halls, and the money so obtained distributed for their benefit. This enterprising veteran had already spent 2½ years in Persia during the Armenian troubles of 1897, so was not new to the venture upon which he was embarking. He was to come self-contained as regards transport and provisions in case circumstances prevented him from accompanying us throughout the entire journey. Accordingly he brought with him as interpreter an Albanian proprietor of a Scutari "hotel" who had spent two years in New York and spoke very fair "American"; he took this opportunity to look up customers and make himself known in the districts through which we were to pass, the market town of which is Scutari.

This heterogeneous caravan set forth on November 7, 1913, and made its way through a terrific downpour of rain, across the old Montenegrin trenches on the plain, to the foot of the mountain some four miles distant; into these we plunged and commenced the ascent to Rioli where it was hoped to find shelter the first night. After crossing several mountain torrents and traversing a very rocky goat-track like road, the destination for that day was reached in the late afternoon, some 1,600 feet up; we were welcomed by the priest of the district at the church house and well pleased he appeared to be at having company in such an out-of-the-way place. We were glad to find that he spoke quite good English, although as in practically all other cases he spoke Italian in addition to his native tongue, Albanian. The church of Northern Albania is subsidized by Austria, although the priests are educated in Italy for the most part.

After a good night's repose on the floor of the dining room we were early astir, and eight o'clock saw us *en route* for Ghoanni, six hours distant. Towards midday after a very trying climb over an extremely rugged track but amidst wild and romantic scenery we reached the summit of Chaffa Biskasit—4,500 feet—and encountered snow for the first time. From here one caught a last glimpse of Lake Scutari and the now famous Tarabosch

Mountain so lately the scene of Turkish and Montenegrin bloodshed. The descent into Ghoanni unfolded a fine view of the surrounding country, and away down in the gentle valley could be seen a vista of cultivated plateaus and white homesteads. The track was frequently marked by large wooden crosses, which in Christian districts appeared to serve as signposts. Shortly before crossing the last mountain torrent and before ascending into Ghoanni on the far side of this valley the judgment of Paris was re-enacted, for a presentation of apples was made at the hands of an alluring Albanian maiden with whom one of our interpreters seemed to have more than a nodding acquaintance.

FIG. 1.—The descent into Ghoanni.

At last Ghoanni was reached in a downpour of rain, but we were soon comfortably housed by our good host the Bishop of Pulati, an intelligent and agreeable man of some forty-five years. A bishop has resided in this district for over 500 years and this particular palace was built early in the 18th century. In the course of a long interview touching on the refugees and their relations with the people of his diocese, one received the impression that his grace possessed much influence over them and this impression was greatly strengthened by later experiences.

The time subsequent to dinner was spent in warming ourselves in the dimly-lighted episcopal kitchen, where an ancient and grizzled Franciscan prepared the meal over the one and only fire on the premises. His lordship, supported by his secretary, presided over a generous repast in which trout from a mountain stream hard by and roast chestnuts from the trees overhanging the cathedral appealed very strongly to our Epicurean appetites. Through our interpreter much information was gleaned concerning the country in general, with which our host was naturally *au fait*.

The guest chamber—so called— was put at our disposal for the night; it allowed some 250 cubic feet per head, but sufficient fresh air found its way from the stable below through the many deficiencies in the floor, and we rose next morning bright and early, well refreshed.

Mr. Willard Howard soon demonstrated his enterprise and stage management in cinematographing his reverence and retinue entering the cathedral for Mass. Meanwhile attention was drawn to a blood-stained military overcoat worn by a youth of the neighbourhood; it appeared that it once belonged to a soldier shot by the wearer, who forthwith proceeded to demonstrate his skill as a marksman by finding the bull's-eye on a stone standing out 500 yards distant on the opposite side of the valley.

Shortly after leaving the palace our journey was interrupted by an incident which possessed more of humour than tragedy, as it eventually turned out. The head of the caravan had just crossed a nullah and was ascending a narrow and treacherous path when the pony carrying the cinematograph stand and apparatus missed its footing and somersaulted down the bank half a dozen times or so before its progress was stayed by a stone wall overhanging a precipitous drop. Extraordinary to relate, the only damage sustained consisted in the smashing of a Tate sugar box containing the films, which were themselves unhurt; and whilst a runner was despatched to the nearest habitation for another box, our philosophic friend, who had outwardly beheld with the greatest sangfroid the rapid descent of his valuable outfit, calmly killed time by recording the accident in his diary, using the wreckage as a desk.

This incident caused a halt of an hour or more, and we beguiled away the time conversing with two natives and listening to a small shepherd boy playing bucolic melodies upon a reed of local manufacture; for which he was awarded with a closer view of the beauties of the surrounding landscape through a pair of field glasses, which drove him into ecstasies of delight.

We noticed that in this district at least it is the custom to place small white wooden crosses in the centre of each maize field after the harvest has been gathered in.

Midday found us on the summit of Chafa Mgulls, 3,180 feet from which Planit, the next halt, two hours distant, could be seen nestling at the foot of a high snow-capped mountain range. Here the ponies received a well-earned rest after the rugged ascent, and some twenty refugees bound for Scutari were cinematographed as they slowly wended their way up from the valley below, a proceeding they appeared much to appreciate and enter into the spirit of, especially when it was explained to them the object thereof.

After crossing several torrents rushing headlong to the river below, as we gradually descended along the north side of the valley, Planit was reached at sunset, which happened to be particularly fine—the chilly whiteness of the snow-clad mountain tops forming a striking contrast to the crimson clouds embracing them. The priest, at whose house we were invited to stay the night, included in his excellent entertainment a limited number of gramophone records, and it seemed more than probable that his household would know these by heart pretty well at the end of the

winter, during which time no communication with the outside world is possible on account of the snow-bound passes. After the evening repast we roasted chestnuts, and ourselves in addition, as we sat round the hearth in a very snug little kitchen and gleaned a fund of interesting but doleful details relating to the refugees and Shala country we were bound for on the morrow; for a native of Abata in Shala had just come in—this fierce-looking warrior possessed both a Turkish rifle and bayonet once carried by some victim of the first Balkan War, and the thought passed through one's mind as one talked with him that he would be a better man to be on terms of friendship with than of enmity. As a matter of fact he proved to be quite an efficient guide over a very cross country route.

We shook down for the night in the spacious dining-hall, and as the gentle light of the new moon stole over the virgin whiteness of the peaks across the valley and mounted sentinel over the roof beneath which we safely slumbered, one could not help contrasting one's lot with that of the wretched sons of Mahommed lately turned out from hearth and home by their Christian brethren across the frontier.

Next morning broke wet and cloudy, which did not make the crossing of a boulder-strewn stream, soon after departing, any the more pleasant, for it was discovered that the bridge had been burned by refugees in their retreat from Shala, seven hours distant, following on a scrap with that tribe.

From this point a dense fog enveloped the party as it scrambled up to Chafa Boshit—4,000 feet—having risen 3,400 feet in the last mile. This pass had lately been the scene of the above-mentioned scrap in which the casualties, comprising eight dead and eight wounded, were fairly evenly distributed. It appeared that a party of Krasnichi refugees on entering the Shala district were asked by some unauthorized headman of the latter tribe for the tax payable in live stock which is normally due whenever large numbers of the latter are driven through any fertile district. This request was complied with, but shortly afterwards these unfortunate people were stopped by the great chief of Shala—Marku Prella—who, ignorant of the unauthorized demands of his dishonest subjects, refused to believe the statement that a tax had already been collected and a heated discussion ensued. The end of the affair was that they proceeded on their journey to Scutari, via Planit, with their flocks; but during the night Marku Prella gathered his henchmen around him and at dawn attacked their camp at Chafa Boshit, with what result has already been related; at the same time enriching himself to the extent of nearly 2,000 sheep and goats. We afterwards heard that the trouble was investigated by the Bishop of Pulati, who compelled him to refund the greater number, a good instance of the Church's power in this barbaric land.

After a short halt the descent into the Shala valley was commenced, and emerging from the clouds as we proceeded downwards along a treacherous shaly track, this broad fertile valley, sheltered by high rugged

peaks, unravelled its beauties to the eye; whilst through the morning mists billowed in fleecy clouds could be discerned far below the river Shala, a tributary of the White Drin following its tortuous course towards the Adriatic; and rising in grim solitude away to the north of this peaceful scene was pointed out the old Turkish fort, Gijtet Dakak; within the moss-covered walls of this melancholy reminder of a great Power's past, much gold, so the legend runs, lies buried, although so far no one appears to have been successful in discovering it.

When the church at Abata, the chief village in Shala, became visible away across the valley, still a good three hours' journey distant, our approach was announced in true Albanian fashion, every member of the party awakening the echoes of the hills with rifle shots.

FIG. 2.—A refugee from Eastern Albania.

The descent to the river had now become exceedingly trying and tedious, but served to demonstrate what a marvellous animal the native pony is over a rough country, in fact stumbling-blocks were only safely negotiated by hanging on to their tails in order to prevent a too precipitous progression.

Fording the river, girth high, and after an almost perpendicular ascent, Abata was reached towards dusk, and we received a right royal welcome of many "guns"; it was not long before we were comfortably seated around a cheerful log fire in the now familiar kitchen, partaking of hot black coffee such as only the Eastern can make.

Our host the priest who had spent thirteen years in this village presided over an excellent dinner for which the fatted calf, or rather in this case goat, had been killed in our honour. The following day found us early astir, for a busy morning was in prospect interviewing chiefs and refugees. It was ascertained that contrary to reports which had reached Scutari these latter were in many instances receiving kindly attention at the hands of the Shala tribe, in fact a good 200 at least were at that moment billeted amongst them—a very fair example of religious tolerance.

The pow-wow with two chiefs of Krasnichi and two of Shala took place in the large dining room where we had passed the night. Captain Francis was enthroned in an old-fashioned armchair with the priest, interpreter, Mr. Howard, and the writer in attendance. Placed on the table was a liberal supply of native tobacco and also cigarettes, which the native rolls himself and smokes from a long embossed silver holder.

Two chiefs of Valbona in Krasnichi were first admitted to our presence and invited to relate their tale of woe. The entrance of these fine specimens of manhood was quite impressive, as they immediately advanced, and on bended knees paid homage to our right hands with their lips. They were obviously overawed but soon regained their composure when offered a seat and tobacco. These two, representing the refugees then in Shala, were cousins named Bairam Curti and Husein Sula; the latter acted as spokesman, and this is what he had to tell, and it will be recorded more or less in detail as illustrating what befell nearly all the population in their neighbourhood early in October.

"Their families totalling some twenty-five souls lived peacefully together in five houses, a few cultivated fields, a mill and about 100 sheep and goats enabling them to live in comparative prosperity. One night a camp fire was seen burning brightly on the mountain side leading up from the valley and when bullets began dropping in close proximity to their houses they were not long left in doubt as to what it portended. Accordingly the women and children with some of their flocks were hurriedly taken to a place of safety, the men returning to find their homes in flames and looting going strong. An effort was made to drive the enemy back, but as was only to be expected the unorganized snap-shooting of a crowd of natives whose only assets were bravery and ancient firearms made little impression upon the foe, who moreover were stated to be in possession of artillery. A hasty retreat took place, Husein receiving a wound in the left flank which appeared to have healed without complications. Dawn broke to find them outcasts in the world with nothing to support them beyond a few sheep and goats, and a limited amount of ready money. Many of these unfortunates eventually found their way to Scutari; but a few tarried by the way, some having friends to go to, others compelled by sickness to rest awhile."

In their case they had discovered a real friend in the Deputy Head

Chief of Shala who for the last five weeks had provided food and shelter for the whole family, four of whom were sick. This good Samaritan, by name, Mehmed Scpeni, now made his appearance and after the customary homage intimated that he was only too willing to do what he could for these people, but his resources were naturally limited, as a matter of fact his land only supplied sufficient food for the winter during which the route to Scutari, whence most of the summer supplies were obtained, was impassable owing to snow.

A promise was made that help if possible would be rendered to both the refugees in Shala and to those who had sheltered them, and having expressed an intention of paying Mehmed Scpeni and his guests a visit that afternoon he withdrew.

FIG. 3.—Two chieftains of Shala.

The Head Chief of Shala was now given audience. Ruling over a district containing quite 500 homesteads, this handsome son of the mountains, with his deep-set eyes, square jaw and dignified carriage looked well fitted to the part. Captain Francis then proceeded to explain to him the object of his mission into his country and a long and heated explanation followed, the main gist of which has already been given in describing the bloodshed at Chafa Boshit, the priest also corroborating the statements. The question was next put to the chieftain as to whether he could

guarantee a safe passage through his country for the Scutari refugees should it be made possible for them to return to Krasnichi. He replied that for his part he was quite willing on condition that the usual toll in kind was rendered for fodder consumed by the flocks; but he was unable to answer for the rest of the chiefs, then waiting outside, without first consulting them.

The remainder of the time was occupied in gathering information concerning the state of the country west of Jacova, which was reported to be in a very unsettled condition, and we were strongly advised not to venture thither if we valued our lives; moreover, we were told that it would be quite impossible to take pack-ponies in any case owing to the precipitous character of the mountain-tracks, which it would be necessary to traverse; nor would any members of his tribe volunteer to act as bearers; they had heard too much of that district already. So most unwillingly the original idea of a reconnaissance of these devastated villages was abandoned, especially as any chance of friction with the devastators was to be strictly avoided.

FIG. 4.—A Shala pow-wow (note the three rifles in the centre).

The two chiefs then withdrew from the "presence," leaving the room backwards with many salaams to confer with their own people.

We shortly afterwards followed to find squatting in a circle on a green just above the church house some thirty fierce-looking braves armed to the teeth. They arose with one accord as we approached, wishing us "long life." These members of the Shala nobility represented four sub-districts, each presided over by a headman. The question of a free pass for the refugees being put to the vote, three sub-districts immediately expressed their approval and three rifles were placed side by side in the centre of the circle; but the fourth was not forthcoming, a long and heated

discussion ensuing, in which the priest took an active part. At last the minority fell in with the majority, the decision being announced with great force by their leader as his rifle took its place alongside the others.

All four were then taken possession of by the priest, who informed us that this method of voting was a most sacred one on their part, and having once sworn themselves thus they would never go back on their word.

The pow-wow ended, our cinematograph friend soon got to work, and fully entering into the spirit of the thing, the chiefs sang a war song to a refrain strongly reminiscent of the East. Each verse ended with a shooting chorus which consisted of the discharge of some thirty rifles into the air, the volleys echoing and re-echoing in the surrounding mountains with weird effect.

FIG. 5.—A Shala marksman.

At the conclusion of the performance several of their marksmen dashed wildly from out the circle and selecting a stone a little over 400 yards away as a target demonstrated their skill in no small measure. A Divine Providence seemed to watch over us all, inasmuch as the fundamental rules for safely handling firearms were ignored with the most supreme indifference. Finally, an old Mauser being thrust into the writer's unwilling hands, he was lucky enough to find the bull's eye once or twice himself amidst great applause.

Thus ended a thoroughly interesting morning, which gave us a very fair insight into the characteristics of this extraordinary race ; at the same time making us feel that part, at least, of our mission had been successful.

After lunch we sallied forth with our host as guide to pay the promised visit to Mehmed Scpeni, who had given us to understand that his residence

lay only a matter of ten minutes away farther up the mountain. It was not long before it was discovered that his idea of distance hardly corresponded with our own, and a warm afternoon, combined with a hearty lunch, only served to accentuate this difference of judgment, as very laboriously we ascended the nearly vertical pathway; it is almost needless to remark that the panorama unfolded to the gaze as we glanced backwards from time to time caused frequent halts for the full appreciation thereof.

En route several still roofless houses were noticed, melancholy reminders of the Albanian insurrections of five years ago which the Turks successfully put down. Eventually after a good hour and half's collar work, the plateau comprising the underchief's estate was reached; in addition to several acres of land partly pasture, partly under maize cultivation, he owned five well-built stone houses and a neatly made wickerwork cottage. Into the latter primitive shelter we entered; on the mud floor in the centre of which crackled a cheerful log fire lay four ailing refugees. From a cursory examination one, a youth, appeared to be suffering from typhoid fever, which of course is endemic, sanitation being practically *non est*; next to him lay an emaciated woman struggling for breath as she coughed herself to pieces in the last stages of some lung complaint, probably phthisis, of which there is a fair amount among these people; away in a corner moaned quite a pretty girl more or less comatose from meningitis; whilst hard by a devoted mother suckled her first born whose entrance into this world of sorrow had been unduly hastened by the hardships entailed in the flight from Valbona.

Each sufferer was receiving the same treatment more or less, a hot infusion of leaves gathered in the neighbourhood; whilst rough but willing relatives tended to their immediate wants. But since it was the will of Allah that fate had treated them thus, their apparent resignation was easy to understand. It should be here remarked that the Mohammedan Albanian woman of the country districts does not veil the face as does her sister of the town.

In the fast gathering gloom we descended once more to the church house which was reached after many a stumble; and having written a report to be sent by runner at daybreak for Scutari the remainder of the evening was given up to "Plain Tales from the Hills" by the captain, and yarns of the Golden West by friend Howard.

The news that a medical man comprised one of our party having spread abroad, quite a collection of "chronics" presented themselves for treatment and advice next morning; much of the latter but little of the former was liberally dispensed, for naturally the quantity of medical and surgical materials at one's disposal was only sufficient for our own emergencies. It might be of interest to mention a few only of these cases. A boy with very advanced staphyloma resulting from an untreated corneal ulcer; two girls with corneal opacities; a woman with very advanced secondary syphilis, such as one very rarely sees nowadays; another with a syphilitic

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periostitis of the os calcis; a chief presenting a nasty axe wound of the thumb which he was dressing with soap; another with severe boils on the arm treated with wet tobacco leaves, which it is said are much used in skin affections by these people.

One's professional keenness tempted one to tarry awhile and investigate fully all and sundry; but seeing that our mission was not a medical one and with heavy falls of snow expected at any time combined with the fact that a good four days' trek stood betwixt us and home, it could not be gratified.

FIG. 6.—Refugee patient with staphyloma of right eye.

So shortly afterwards we tore ourselves away, a fusilade of rifle shots speeding the parting guests.

A couple of hours later we chanced to meet the priest of Boga on his way to visit a friend two days' journey distant. We had counted on the shelter of his hospitable roof two nights hence, but any doubts on that point were soon dispelled when he very kindly gave us a note of introduction to his mother who kept house for him.

Shortly after bidding him "bon voyage," and whilst riding in single file along the banks of the swift and turbulent River Shala, the report of a rifle rang from the mountain side, and a bullet narrowly missed our leader

as it went whistling by with a sound not to be mistaken, to bury itself in the ground barely five yards on our flank. For what reason, if any, the shot was fired and by whom it was not possible to say, but the incident gave one an insight into the character of the gendarmes who have so far been undeservedly neglected in this narrative. One of them who happened to be riding just in the rear of the captain immediately showed his devotion by advancing and taking up a position between the latter and the mountain side; and without halting the command to fire a few rounds in that direction was calmly carried out.

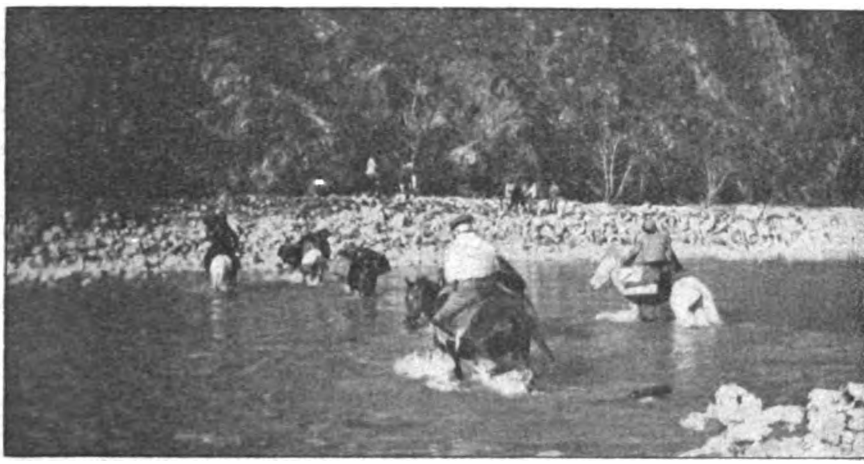

FIG. 7.—Fording the River Shala.

A few minutes later, after fording the river and reaching dead ground, a council of war was held, at which the gendarme corporal, himself a native of Shala, very passionately expressed his feelings on the subject; that such an outrage should have been attempted in his own country was a great dishonour to his clan, and if we would at once return to Abata, the head chief would at once turn out with several hundred men and attempt to run the miscreant to earth.

However, after mature reflection, it was considered best to proceed on our way, at the same time sending one of the guides back to the priest of Abata notifying him of the incident and requesting that the matter should be investigated. The sequel will appear later.

So we resumed our journey, the grandeur of the scenery increasing at every step, as crossing and recrossing the river, now emerging from its torrential origin, we picked our way amidst huge boulders, offsprings of the precipitous, partly pine-clad mountain walls rising up sheer to 1,000 feet on either side to be lost in snow and cloud; until, coming upon the greenest of green oases within a stone's throw of a sparkling cascade, it was considered we could not do better than make this the midday halt for lunch.

The Franco-Albanian interpreter here created some amusement and compelled a descent from the appreciation of the sublime to the ridiculous; a mendicant simpleton of the district thrusting his presence upon us received a certain amount of response to his pleadings, but on approaching Petre was subjected to a mock medical examination; very solemnly he percussed the chest, felt the pulse and examined the eyes of the mystified stranger, and writing a prescription, of which the principal ingredients appeared to be soda and quinine, handed it to him, at the same time informing him he would be able to obtain the medicine in Scutari.

An hour later we emerged from this cañon to find ourselves at Thethi, a small village of scattered cottages situated in the midst of cultivated land surrounded on all sides by rugged mountains of considerable height; indeed, so enclosed is Thethi that at this particular time of the year (November) sunset occurred at 2 p.m. and sunrise at 10 a.m., in spite of which this sheltered spot has a great reputation as a health resort for Scutari consumptives, many of whom have derived considerable benefit from a sojourn there.

The news of our approach appeared to have preceded us—shouting across valleys constitutes a very rapid mode of communication—and the inevitable musketry salute was fired by a small crowd of village folk assembled at the church house, where we decided to spend the night.

Early in the afternoon though it was, dusk was rapidly gathering and no time was lost in photographing a family of fifteen Mohammedan refugees from near Jacova; they had for the last five weeks received board and lodging at the hands of our cheerful Franciscan host. The children of this group, on seeing our uniforms, mistook us for Servians, and it required not a little guile and patience to allay their fears and stay their tears.

We saw here a man convalescent from a bad bullet wound in the foot, which he had received whilst on outpost duty when his tribe was attacked by the Servians some weeks previously.

After a tea consisting chiefly of goat's milk (Mediterranean fever is not known to exist in Northern Albania) and of mountain honey of rare flavour, an informal visit was made to a cottage close at hand; this humble abode, substantially built of stone, stood in its own little plot of land, and admittance was gained through a low and narrow door to find the ground floor given up to live stock as usual; climbing some broad but ladder-like stairs, a primitive scene presented itself to our eyes; on stone slabs in the centre of a good sized room burned a cheerful log fire, the smoke making its way out through blackened rafters and three narrow slits in the wall answering the double purpose of windows and rifle loopholes for protecting the house in case of blood-feud siege. From the beam in the roof hung a chain from which was suspended a simmering pot of broth, and on the walls hung festoons of drying tobacco leaves. Squatting in a circle around the hearth were several of the household, one woman suckling her babe *coram publico*, one knitting socks, another making embroidered slippers and two youths doing

nothing. This happy circle we were invited to join, and whilst sampling some very acid-tasting goat cheese our cigarettes seemed to be much appreciated by both men and women.

Squatting oriental fashion not being exactly our forte, the visit was not unduly prolonged, and by the light of the full moon rising majestically over a distant pass we strolled leisurely back, reflecting deeply the while on this fleeting glimpse into the Stone Age.

Evening found us once again seated around the glowing embers of the church house; merry and bright was the company as it sang the Albanian National Anthem and other patriotic ditties to the accompaniment of a broken-winded concertina and a fiddle decidedly the worse for wear, not to mention a rifle shot through the window now and then by way of variation. But with dramatic suddenness the scene was changed; the door burst open and admitted a chief of Shala, by name of Sacol Cola, much out of breath and anxiety written on every line of his manly features. It seemed that upon receipt of the letter notifying the sniping incident of the morning, the chief of Abata decided to convene a meeting of chieftains for the purpose of investigating the affair and deciding what measures should be taken.

Now when any matter calling for urgent and immediate attention arises, the church bells ring forth into the valley and three rifle shots are fired in quick succession. This procedure was adopted in this case and in an incredibly short time some 200 chieftains had responded to the call. The assembly decided that the chief, Sacol Cola, ruling over the mountain side whence the shot was fired, should be given until noon next day to discover who was responsible for it, and failing this, unless he obtained a free pardon from the English captain, his house would be burnt to the ground. Of course, as was only to be expected, his efforts to discover the miscreant proved quite unsuccessful and he lost no time in following us up.

Seeing that it was quite impossible to prove that the shot was otherwise than an accidental one the poor fellow was given the benefit of the doubt and he was promised that no further notice would be taken of the incident; a note being given him for the priest to that effect. Whereupon falling at his pardoner's feet he again and again saluted his hand in thankfulness of heart, after which he lost very little time in setting out on the return journey. Later on in the evening arrived a special messenger with a letter signed by the priest and two chiefs of Shala apologizing for what had happened and corroborating all that had been told by Sacol Cola.

After our interpreter had penned the reply which meant so much we turned in, well satisfied with the events of the day.

Early on the morrow audience was given to certain headmen of the village who stated that owing to a blood feud their people were prevented from passing through Vraka, a village on the main road to Scutari, and requested that the authorities there might be petitioned to exert their influence in the settlement of the matter. Just before taking our departure

the villagers presented us with a sheep which unfortunately we were unable to take with us.

An hour later after treking along a well cultivated valley and crossing the river, the ascent to Chafa Shtegut, 6,000 feet, hidden away in the clouds, was commenced. The road proved to be nothing more than the rugged bed of a mountain torrent which only flowed in the spring when the snows melted. Huge jagged bolders and the naked trunks of numerous pine trees bestrewed the way and it was only complete confidence in our faithful native guide which dispelled any doubts we might have had as to the possibility of ever reaching the summit safely, which we eventually did at noon.

Sending ahead the transport to pick its way as best it could down a very similar road the other side, a chilly half-hour was spent on this snow-bound wind-swept spot whilst a cinematograph panorama was taken of the well-wooded valley stretching away to Boga, now faintly discernible through the emerald mist; whilst wild and bleak on either hand stretched range on range of pine-clad snow-covered peaks, sorrowful in their solitude yet majestic withal.

Descending into the primeval forest composed largely of beech trees, Boga was reached at dusk. A runner had gone on before with the note of introduction from the priest and a right good welcome his kind old mother extended us. If her son ordinarily received the same amount of attention then he lived indeed in the lap of luxury.

The following day's journey to the next halting place was fortunately only a matter of some four hours, for very squally weather with a thunder-storm thrown in did not make the track over a level but bolder-strewn larva road any too pleasant. Our last hostel turned out to be quite the largest and most spacious dwelling we had so far come across, its owner having the reputation of being quite well off. He was certainly quite a sportsman to judge by the presence of a double-barrelled shot-gun, together with a well-bred pointer in the kitchen hall, where of course we soon found ourselves getting dry around a huge log fire. As bad luck would have it the Franciscan had that day gone on a visit to a distant parishioner and so no doubt we were deprived of an opportunity of learning first hand a little concerning the sport to be obtained in the neighbourhood

So we had to be contented with watching the manufacture of an Albanian "standard loaf" by the handmaiden of the house, whose figure and looks were themselves also well up to standard. This loaf, made of maize, is some two inches in thickness with a diameter of quite two feet. Baked in the good old-fashioned oven, heated with red-hot embers, a little appears to go a long way, and possibly one cause of the excellence of the native teeth is to be found in the coarseness and hardness of this staple article of their diet.

Next morning turned out fine and clear, allowing an uninterrupted view

down the valley and across Lake Scutari to Vir Pazar, where during the war a Red Cross field hospital was established for the Montenegrin wounded.

A six hours' ride down this valley and across the plain of Stoi brought our caravan once again to Scutari. Thus ended a trip full of interest from beginning to end into a part of the world as yet untouched by the officers of the Royal Army Medical Corps.

Current Literature.

In the *Indian Journal of Medical Research* for January, 1920, R. H. Malone describes a method of detecting *Pfeiffer's bacillus* in the secretion of the respiratory tract by means of the production of indole. Jordan has already pointed out that some strains of *Pfeiffer's bacillus* produce indole in culture, a property which is not shared by any of the other hæmophilic bacteria to be found in the respiratory tract.

TECHNIQUE EMPLOYED.

(*a*) The material to be examined is planted on two slopes, one of plain agar, and one of heated pigeon's blood agar. The cultures are incubated for twenty-four hours at 37° C. At the end of this time the cotton wool plug of each tube is moistened with about six drops of Ehrlich's reagent, and two drops of a five per cent aqueous solution of potassium persulphate. (The latter may be omitted without vitiating the test.) The tubes are then placed in boiling water for about fifteen minutes. Indole being volatile is driven off and as it comes in contact with the moist cotton wool the rosindole reaction is observed, the colour varying from rose to mauve.

(*b*) Now, while the tubes are still warm, two cubic centimetres of Ehrlich's reagent and 0·5 cubic centimetre of the persulphate solution are floated on the surface of the melted agar. A positive result is indicated by a rose-coloured ring at the junction of the agar and the reagents, which deepens into a cherry red on standing for a few minutes.

(*c*) The tubes are gently shaken and the red fluid is pipetted off into small test tubes containing two cubic centimetres of methylated chloroform. A violet ring forms at the junction of the two liquids, and on shaking and gently warming, the chloroform assumes a violet tint while the supernatant fluid gradually loses its red colour.

Three variations of the test can therefore be performed on one and the same culture.

The cotton wool plug test shows that the substance giving the colour reaction is a volatile one.

The chloroform extraction controls the ring test and shows that the true cherry red colour is soluble in chloroform.

Pathogenesis of Secondary Diphtheria and the Schick Reaction.—Jules Renault et Pierre-Paul Lévy (*Bulletins et Mémoires de la Société Médicale des Hôpitaux*, juin, 1920).—The authors point out that three factors are involved in the successful inoculation of diphtheria; (i) Virulent bacillus; (ii) non-immune host; (iii) lesion of mucous membrane. Such a lesion is present in scarlet fever,

hence the severity and common occurrence of diphtheria as a complication of this fever. The Schick reaction can be utilized in scarlet fever to demonstrate the second factor.

The authors studied in 1919 twenty-three cases of scarlet fever by means of the Schick reaction, this was positive eleven times and twelve times negative. One carrier was found in the second group and he did not develop diphtheria—no carriers were found among the non-immune or Schick positive group.

Among twelve cases of whooping cough, six were negative to the Schick test and did not harbour the bacillus in their throats—six were positive and one was a carrier and developed diphtheria.

Of two children with middle ear disease, one was neither a carrier nor susceptible to infection; the other was both, but there was no lesion of the mucous membrane of the throat and he did not develop the disease.

The same was the case in regard to a young child with chicken pox, susceptible and a carrier but with healthy mucous membrane—no diphtheria.

Two cases of angina—in the one the diphtheria reaction was negative, the child was thus shown to be refractory to infection. Her throat yielded a culture of virulent diphtheria bacilli—she was cured without any injection of serum and did not develop diphtheria. In the other the Schick reaction was positive, the subject was thus shown to be susceptible. Culture isolated a bacillus which proved to be avirulent. No diphtheria resulted. In the case of these two angina patients the mucous membrane was much injured. In one case the bacillus was virulent but the patient was immune, in the other the patient was non-immune but the bacillus was avirulent.

The authors studied forty-two cases of measles in all stages of evolution of the disease. In these forty-two cases the Schick test was positive in twenty-two, negative in twenty. Amongst these children three carriers of the *Bacillus diphtheriæ* were found, two amongst the immune and one among the susceptible; the latter contracted a diphtherial laryngitis. The two carriers with the negative reaction remained free from the disease in spite of the fact that the bacilli isolated were proved to be virulent. A fourth patient who gave a positive Schick but whose throat culture was negative nevertheless developed diphtheria eight days later. Thus it was shown that the Schick reaction is just as reliable in measles cases as in other eruptive fevers, a fact which had been previously open to doubt.

One child showed a positive Schick reaction, i.e., non-immune; thirty-eight days before she had suffered from a mild sore throat and as a precaution had received a prophylactic dose of anti-diphtheritic serum; soon after this she gave a negative Schick reaction, but this was followed one month later, as stated, by a positive reaction. In another case in which a child had been exposed to active infection the Schick reaction remained negative six months after, thus demonstrating the evanescence of the immunity produced by a dose of immune serum as opposed to permanence of immunity produced by active immunization.

So much reliance indeed do these authors place on the results of a Schick test that if they find a patient harbouring a virulent K.-L. bacillus and with damaged mucous membrane, but giving a negative Schick reaction, they do not consider it necessary to give serum, the patients making good recovery with ordinary methods of treatment. Such cases are really examples of, say, Vincent's angina in a resistant carrier of the K.-L. bacillus. D. H.

Cholera:[1] (1) **"Uber Exantheme bei Cholera asiatica"** Arzt. (Exanthemata in Cases of Asiatic Cholera), (*Wein. klin. Wochenschr.*, 1917, p. 901. **Extracted** from *Centralbl. für Bakteriol, etc.*, Referate, December 16, 1919, p. 499).—

[1] For this and the following summaries we are indebted to Lieutenant-Colonel S. P. James, of the Ministry of Health.

A description of four cases of cholera in which exanthemata appeared. The primary efflorescences of the eruption were small throughout, mostly brown-red maculæ which were confluent in all four cases. No special locality was involved, but in no case were the face, neck, hands, legs (below the knee) and feet affected. The rash appeared either at the end of the second or beginning of the third week of illness and lasted from three to five days. One case exhibited hæmorrhagic symptoms. Recovery was without desquamation. The author regards the exanthemata as due to toxins caused by the absorption of poison which has its origin in the disease itself.

Diphtheria: (1) Contacts and School Attendance.—Dr. Joseph Cotes, Medical Officer of Health, St. Helens, found that it was possible to allow contact children to continue attendance at school by arranging that each school should be inspected every day by a nurse health-visitor. Contacts were especially examined and any child absent from school for more than two days was visited at home. The district was divided up into areas containing roughly 1,000 population and to each of such areas was allotted one nurse. It is reported that the school attendance figures notably improved, while infectious diseases were also better controlled.—*Medical Officer*, January 24.

(2) **The Schick Reaction.**—In discussing a recent paper in the *Lancet*, by Dr. H. Mason Leete, on the Schick test, the *Hospital* for February 7 very considerately "begins at the beginning" and describes the test as follows:—

"The Schick test is carried out by injecting a small dose of diphtheria toxin into the skin. This injection should be intra-cutaneous and of accurate quantity, which is in practice about $\frac{1}{50}$ of a minimal lethal dose. The best site is the flexor aspect of the forearm, just below the elbow, and a round white wheal about the size of a large split pea should be found. We may quote from Dr. Leete's own experience as to the typical positive reaction, but for variations, discrepancies and difficulties we must refer the reader back to the author's article (see *Lancet*, January 24, p. 192). Says Dr. Leete, 'A typical positive reaction begins to show distinctly in from twenty-four to forty-eight hours and reaches its height about the third day. It is a sharply circumscribed area of redness, with definite though slight infiltration, circular or somewhat oval in shape, and varying from half to one inch in diameter. This persists for about a week and on fading leaves a brownish pigmented area which shows traces of desquamation. A negative reaction is shown by the absence of redness and infiltration; after twenty-four to forty-eight hours nothing can be seen, except a point of redness marking the needle track.'"

The *Hospital* writer continues by suggesting that the reaction provides valuable aid in diphtheria control provided it can be relied upon to indicate the presence or absence of natural antitoxin and a consequent natural immunity.

(3) **Toxicity of Bacilli isolated from Contacts.**—Frank Hatchel and Mary Shedwick Bailey of the Baltimore Health Department consider, as a result of their investigations, that "the members of the community at large are not often sources of diphtheria infection . . . School children do not furnish the source of infection." They conclude that convalescents and contacts are the chief distributors of the virulent bacilli. Thus out of cultures from nose and throat of 4,093 healthy persons it was shown that only about 1 in 10,000 persons were potential sources of infection. As regards school children, approximately 0·49 per cent of the children, in a series of 1,217, contained virulent bacilli in their throats. During the years 1916, 1917 and 1918, 499 or 9·06 of positive results were obtained in the case of swabs taken from entire households in which the disease was reported. Further, 97 per cent of the morphological *B. diphtheriæ* isolated in these cases were toxic to guinea-pigs.

(4) **Brilliant Green and Diphtheria Bacilli.**—Kolmer, Woody and Yagle of Philadelphia have been experimenting with brilliant green (Grubner) as a disinfectant for diphtheria bacilli. They find: (1) Brilliant green is highly bactericidal to virulent diphtheria organisms *in vibro*; blood and serum in the medium reduce its power. (2) The dye is greatly potent in the case of staphylococci. (3) In the case of diphtheria carriers both the true and the pseudo form of bacilli disappear temporarily from the noses, throats and ears of affected persons; permanent disappearance however was not noticed.

Encephalitis Lethargica: (1) **Transmission to Rabbits.**—Loewe, Horsfield and Strauss, in the *Journal of Infectious Diseases*," 1919, 25, 378, give details of the successful transmission of the disease to rabbits by the intracranial injection of the filtrate of the nasopharyngeal mucous membrane from a fatal case of epidemic encephalitis (*vide Medical Science*, February, 1920).

(2) **In America.**—Abrahamson, in the *New York Medical Journal*, 1919, states that lymphocytosis is much more frequently noticed in America than in Europe. He suggests that "epidemic polioencephalitis" is a truer description of the disease because the essential lesion involves the nuclei of the brain. The term "lethargic," he thinks, should be dropped because the encephalitis itself is not lethargic, and lethargy is not found in the majority of cases, many of whom suffer from mental excitement and sleeplessness.

(3) **Recrudescence of Epidemic Encephalitis Lethargica.** By M. Arnold Netter (extracted from the *Bulletin de l'Académie de Médecine*, January 6, 1920).—"On May 8, 1918, I conversed with the Academy about encephalitis lethargica, acquainting them with the chief symptoms of this illness, and describing its appearance in the shape of a small epidemic. Numerous convincing proofs came from most diverse parts of France, from England and from other countries. In the course of these last weeks, encephalitis lethargica has reappeared with a still greater frequency. Since November 26 we have personally observed twelve cases, and know of more than twenty others. It seems, therefore, a good opportunity to draw the attention of the medical profession to this subject. The disease was recognized seven times by our colleagues, only two of whom had observed it previously. This detail seems to me to furnish the best proof of the usefulness of our previous communications, and justifies the further information which we consider it well to give to-day: Two of our cases made their appearance in November; four the first week in December; three the second week in December; two the third week in December; one the fourth week in December. They were all isolated cases; moreover, they happened in very different neighbourhoods. One in district No. 3; two in district No. 4; one in district No. 5; two in district No. 7; one in district No. 8; one in district No. 10; one in district No. 14; one in district No. 15; one in district No. 16. The last case occurred in the suburbs of Paris. Of the three chief symptoms of the illness, fever and somnolence were present in every case. Diplopia followed by temporary paralysis of accommodation was lacking in one-third of the cases. The hypoglossal nerves were affected in three cases, and the facial twice; three patients had tremors and one generalized convulsions. Three times we remarked a very plentiful salivation. All three symptoms form part of the habitual manifestations of encephalitis lethargica. It appeared to us that the motor centres of the eye were less severely attacked than in our former cases. In most of the patients undergoing treatment at the present moment the illness started more than three weeks ago; two have recovered without retaining any effects, two are dead, and it is still impossible to make any pronouncement on the prognosis of the other patients. We intend to return later to this question if the Academy desires it."

"Eine elektive Farbungsmethode für influenza Bazillen." (Grippe und Tuberculose). By J. de Seixas Palma, Lugano. (A selective method for staining influenza bacilli.) *Centralblatt für Bakteriologie, etc.*, Originale, October 31, 1919, pp. 507-9.—The author claims to have found a stain by which he has proved the following facts: (1) that the cause of the so-called "Spanish grippe" is the influenza bacillus of Pfeiffer; (2) that the influenza bacillus is acid-proof, and can be confused therefore with tubercle-bacilli "splinters," (? segmented form); (3) that the filtrable grippe virus is no other than a form of the *Pfeiffer bacillus* (granular form); (4) that the influenza bacillus can pass through a new Berkefeld candle. Dr. Palma describes two methods of staining, and combines them to form his selective staining method for sputum, blood and urine. He then gives a description of the stained influenza bacillus. It appears as a black stained streak, or as a granule. The precipitate caused by the action of the Hg on the fat globules, etc., especially of blood, may be confounded with the small granule of the *Pfeiffer bacillus*, therefore a certain amount of practice is necessary in the technique. The writer avers that the influenza bacillus does not die in the human blood, and that an enormous number of influenza bacilli is exhibited in the blood of grippe patients. According to his theory mercurial soap should be a therapeutic means of combating grippe, and the bacilli of grippe germ carriers.

Use of Gauze Face Masks.—W. H. Kellogg and Miss Grace MacMillan contribute to the *American Journal of Public Health* for January, 1920, the results of their experiments on the efficacy of gauze face masks in influenza, etc. They find: (1) Gauze masks exercise a certain amount of restraining influence on the number of bacteria-laden droplets possible of inhalation; (2) this influence is modified by the number of layers and fineness of mesh of the gauze; (3) when a sufficient degree of density in the mask is used to exercise a useful filtering influence, breathing is difficult and leakage takes place around the edge of the mask; (4) this leakage around the edges of the mask and the forcible aspiration of droplet-laden air through the mask is sufficient to make the possible reduction in dosage of infection not more than 50 per cent effective. Masks have not been demonstrated to have a degree of efficiency that would warrant their compulsory application for the checking of epidemics.

Destruction of Rats by means of Varnish.—The *Local Government Chronicle* for February 7 considers that Dr. Howarth's experiments in catching rats by means of varnish have proved very successful. The substance used is a strong lithographic varnish warmed sufficiently for it to be spread $\frac{1}{16}$ inch to $\frac{1}{18}$ inch thick on pieces of cardboard or strawboard measuring about 15 inches by 12 inches. A margin of about one inch is left clear of varnish and bait is placed the in centre of the board where it adheres to the varnish. The traps are placed along the runs or near the holes; they remain effective for about four days. Dr. Howarth states: "The varnish is not poisonous . . . I think that they die of fright. Once their tails stick their doom is sealed. They never get near the bait. They get their feet in the varnish and the more they struggle the more they stick. Rats caught in the night are always dead in the morning."

Rat-Bite Fever: (1) Experiments dealing with the transmission of.—The current belief that the spirochætes of infected rats find their way into the salivary glands and ducts of the rodent and that transmission to humans comes through the saliva of the rat is being assailed by Japanese investigators. In the early stage of the disease in wild rats, albino rats and guinea-pigs the spirochætes are found principally in the blood, but after two weeks a large number of the organisms appear in the connective tissues of the eyelids, lips, bridge of nose and tongue and are especially abundant in the reticular connective tissue of the vascular sinus surrounding the follicle of the tactile hair of the upper eyelids and

lips. "To explain the exit of the spirochæte from its source in the rat, if it does not pass through the saliva, Kusama, Kobayashi and Kasai assert (*Kitasato Arch. Exper. Med.*, 3, 131 (Oct., 1919), that the infected wild rat and also the infected guinea-pig, usually become very irritable and furiously bite any object coming their way, often suffering an abrasion and even bleeding from the lips and gums. The spirochæte is then given an opportunity to escape from the sub-mucous tissue, or the circulating blood, through the defective point in the mouth. It becomes possible, therefore, that the spirochæte may be thus transferred by the bite of an infected rat to the body of a healthy rat or even a human being." It is stated that experiments do not favour the supposition that fleas or lice act as transmitting agents, but on what grounds this conclusion is reached is not stated.—(*Journal American Medical Association*, January 24, 1920.)

Mortality from Tuberculosis in Prussia during the Years 1877-1917. (Extract from the *Deutscher Reichsanzeiger*, December 30, 1919).—The Prussian Statistical Provincial Bureau publishes a comparative survey of the above subject from which a few figures of general interest may be reproduced here.

In the year 1877 the Prussian State had 26,169,335 inhabitants; the population increased steadily in the following years, and in 1914 reached the figure 42,223,453. In 1915 and 1916 the census was not taken on account of the war; in these two years the census of 1914 served as a basis in reckoning the deaths from tuberculosis. For 1917 the male population was reckoned from the female population of December 5, 1917, on the basis of the proportion of the two sexes in the census of 1910. The total number thus obtained does not differ materially from that of 1914.

The total deaths from tuberculosis and the deaths from tuberculosis per 10,000 of the inhabitants are as follows:—

	Total Deaths			Deaths per 10,000 inhabitants		
Year	Male	Female	Total	Male	Female	Together
1877	46,027	37,742	83,769	35·88	28·44	32·01
1883	47,626	41,211	88,837	34·61	28·99	31·75
1890	45,033	39,053	84,086	30·65	25·65	28·11
1895	39,675	34 077	73,752	25·45	21·14	23·26
1900	27,984	32,618	70,602	23·14	19·19	21·13
1905	36,626	33,697	70,323	20·21	18·08	19·13
1910	31,090	29,389	60,475	15·92	14·68	15·29
1913	29,288	27,573	56,861	14·22	13·10	13·65
1914	30,218	28,359	58,577	14·47	13·29	13·87
1915	31,298	29,708	61,006	14·99	13·92	14·45
1916	32,990	33,554	66,544	15·80	15·73	15·76
1917	43,144	43,888	87,032	20·80	20·15	20·62

The death-rate from tuberculosis was at its highest in 1883, with 88,837 deaths, and at its lowest in 1913, when there were 56,861 deaths. If we look at the deaths in relation to the population, another aspect of the matter presents itself. In the year 1877, 32·01 per 10,000 of the population died of tuberculosis, and in the year 1878 the number rose to 32·51, then it decreased with the exception of the years 1883, 1884, 1886, 1890, 1900 and 1903, which show a slight increase against the previous years. From the year 1903 to the year 1913 inclusive there was a large and steady decrease in the deaths from tuberculosis, which fell from 19·64 to 13·65. This decline in mortality from tuberculosis was primarily due to the active warfare carried on against the disease.

The aspect of affairs changed again with the beginning of the war in 1914, when an increase in the death-rate already took place. This increase continued in 1915 and 1916, and in the year 1917 the mortality rate from tuberculosis was 20·52 per 10,000 of the population, an increase of 6·87 against 1913. In 1918, according to the quarterly statistics of causes of death, there was a further

increase of deaths from tuberculosis to 96,844 or 22·83 per 10,000; no separation of the sexes was indicated.

If the number of deaths in separate age groups in 1913 with those in 1917 is compared, it is to be seen that the deaths of children of the male sex of under a year old have risen from 20·59 to 21·16, and of female children from 16·33 to 18·56.

The deaths in other age groups show an increase in 1917 over 1913 per 10,000 of the population.

Age group	Male	Female
1—2 years	5·28	5·53
2—3 ,,	7·12	8·50
3—5 ,,	3·15	3·66
5—10 ,,	2·12	3·06
10—15 ,,	2·28	4·66
15—20 ,,	11·89	9·57
20—25 ,,	11·74	9·26
25—30 ,,	8·24	9·32
30—40 ,,	5·67	8·50
40—50 ,,	6·91	8·63
50—60 ,,	9·06	6·87
60—70 ,,	8·62	4·64
70—80 ,,	5·18	4·96
80 years	2·45	3·34

This increase in all age groups should in the first place be traced back to the effects of under-feeding; in women of a working age during war-time it is attributable to unaccustomed labour combined with bad feeding, and in women of a child-bearing age to the influence of insufficient food during pregnancy.

Typhoid Fever: (1) Effect of Typhoid on Tuberculosis.—From a study of sixteen cases Clovis and Mills of Terra Alta, W. Virginia, came to these conclusions: (1) The co-existence of these diseases should require a high caloric feeding; (2) prolonged bed rest during convalescence is advisable as a precautionary measure; (3) typhoid vaccine gave severe reactions only on the active cases, but with no permanent bad effects; (4) patients with active pulmonary tuberculosis may have typhoid fever and recover without any detrimental effects on the pulmonary condition, while the general condition may often be improved; (5) patients with active pulmonary tuberculosis may have typhoid fever and recover without a more rapid advance on the pulmonary condition than would have occurred had they not had typhoid; (6) pulmonary tuberculosis did not have any appreciable effect on the course of the typhoid fever.

(2) Carrier Outbreak.—Dr. Lewys-Lloyd, Medical Officer of Health for Merioneth, describes in the *Medical Officer* for February 7 a small outbreak at Towyn which was started by a carrier engaged in the distribution of milk.

"Nouvelles recherches sur le liquide cephalorachidien dans le typhus exanthematique." Danieloplace. (New Researches into the Cephalorhacidian Fluid in Exanthematic Typhus Fever). No. 1, 1918, of *Annales de Médecine*, extracted from No. 1, 1920, p. 19, of *Schweizerische Medezinische Wochenschrift*. —The author had already previously studied the cerebrospinal fluid of twenty-four cases of typhus fever, publishing his observations in No. 5, 1917, of the same paper. He now confirms those observations after research work upon material from 142 further cases of the disease. The cerebrospinal fluid in typhus fever frequently exhibits an exanthochromatic colour, especially in the second week of illness in which the severe nervous symptoms appear in the foreground. This colouring was present in forty-eight cases and each time, prognostically, it was a bad sign. These patients showed upon autopsy a marked enlargement of the

meningeal blood-vessels. The coagulability of the cerebrospinal fluid increases considerably in this disease, likewise the leucocyte contents (10 to 225 leucocytes per cubic millemetre); these are mostly lymphocytes, but sometimes also polynuclear leucocytes and not infrequently plasma-cells are present. The albumen contents are increased and the Noguchi test for globuline is positive. The presence of all these reactions in the cerebrospinal fluid suggests a specific action of the disease toxins on the nervous system and its vessels. The leucocytosis appears first and, in recovery, disappears last.

Vaccination: (1) Scarless Method.—It appears that there is a way of avoiding the scar in vaccination, viz., by hypodermic injection. Major Goodall of the Canadian Army has used this method in the case of 6,000 soldiers and children and claims these advantages: (1) Absence of an open wound subject to infection; (2) ability to dispense with dressings; (3) high percentage of "takes"; (4) comparative mildness of local and general reactions; (5) rapidity and easiness of technique in case of children. Nothing is said, however, about the degree, if any, of immunity conferred by this method.—*Journal of the American Medical Association*, January 24, 1920.

Reviews.

THE NEW PHYSIOLOGY IN SURGICAL AND MEDICAL PRACTICE. By A. Rendle Short, M.D. Fourth Edition. Bristol, 1920: John Wright and Sons, Ltd.

That this small book meets a want is well shown by the fact that four editions have been called for in nine years. The book undoubtedly does give a good account of modern physiology in relation to practice. It must not be imagined, however, that even this edition will serve as more than an introduction to the subject—the excerpts are too short and too general.

The field covered is wide and, on the whole, the various problems discussed have been dealt with in a most catholic fashion. The chapter on surgical shock gives a really excellent review of the present views. The nervous system has also been well done. A good deal of space has been devoted to the glands of internal secretion, but, probably in view of the many difficulties, the *useful* conclusions reached are not very striking. The book generally is well got up and the index serviceable.

MALARIA AT HOME AND ABROAD. By Lieutenant-Colonel S. P. James, M.D., D.P.H., I.M.S. (retired). London: John Bale, Sons and Danielsson, Ltd. Pp. 234 + xi, with one coloured map and 104 full-page text figures. Price 25s. net.

The title of this publication would at first sight seem to be more ambitious than the size of the book would warrant, in view of the mass of literature which has arisen in one section alone of the important subjects dealt with. But a reference to the author's explanatory note shows that the book "is intended to be an elementary guide to medical men and administrators who may have to deal with malaria at home or abroad during peace or war." And very well indeed does the book fulfil this intention: there are many books and pamphlets dealing with one or more of the various sections of the malarial problem, e.g., treatment, diagnosis, prevention, epidemiology, etc., but we question if any previous author has so

successfully contrived to deal with the really salient features of each and all of these sections in such a practical way and in so small a space. In reading this treatise it must be remembered that it is not intended for the expert, although the expert, say on treatment, will find much that is useful and possibly new to him in the section regarding the life-history of the parasite or the identification of the intermediate host.

Chapter I is devoted to a very clear description of the specific pathogenic agent and its life-history; several illuminating and original diagrams are given, which should be useful not only to the student of the subject but to the teacher.

In Chapter II the source of infection—that is the gametocyte carrier—is discussed, also the carrier of infection—the mosquito—and the recipient, i.e., the susceptible person. This is shown in a diagram under the title of the etiological chain.

Under environment it is pointed out that outbreaks of malaria among bodies of imported labourers are not due merely to the "opening up of the soil," although this is one factor, in view of the creation of new breeding places for the mosquito, but that other factors also play a part, and one of these, indeed, may be the dominant factor, namely, the aggregation of a large number of susceptible persons with the infected, i.e., the general conditions inseparable from the existence of great labour camps in the tropics.

The method of taking, making and staining films is fully described, and we are glad to see that the necessity for the study of normal blood is strongly insisted on before the student embarks on the hunt for parasites in the blood of possibly infected people. We have painful recollections of being asked to show some enthusiasts "a few malarial parasites," so that they might be able to recognize them again, and the scorn with which the suggestion that they should first spend at least a week staining and studying films of their own blood was received. In a well taken and stained film it is the easiest thing in protozoology to recognize, say, a gamete or a rosette of benign tertian malaria, but it requires an expert to say that in another and perhaps not so good a film there is no malarial parasite to be found. That is to say, that the man who wishes to become an expert in the diagnosis of malaria with the microscope must first of all spend months in the study of normal and abnormal blood other than malarial.

A very useful section is devoted to the methods of studying the zygotes and sporozoites in the mosquito, with directions for dissection and mounting of specimens. This is followed by a full description of the mosquito carriers of malaria, with a method for their identification and classification. Synoptic tables are also given of the various species of Indian and African species of anophelini. Follows then a discussion of mosquito habits, and the extreme importance of a study of these is insisted upon. A useful grouping of species according to habit is included. Thus:—

(*A*) *Urban mosquitoes.*
- Group 1. The strictly household species.
- Group 2. Other urban species.

(*B*) *Rural mosquitoes.*
- Group 3. Strictly sylvan species.
- Group 4. The migratory species.
- Group 5. Species with peculiar or unexpected habits.

The method of carrying out a malarial survey both at home, as was recently done when large numbers of infected soldiers were suddenly imported, and in the tropics, where malaria is endemic, is fully described, and may be taken as a model to be followed by others when called upon to carry out a survey. The points to be noted in such a survey are:—

(*a*) A general description of the district, its climate and population, with study of the vital statistics, if available.

(*b*) Chief causes of sickness and mortality.

(*c*) The amount and kind of malaria to be determined by an estimation of the spleen-rate and parasite-rate.

(*d*) Anopheles factor. Kinds of anopheles present and their abundance; identification of the species principally concerned in the spread of malaria, by means of dissection, and an estimation of the percentage-rate of infection; a study of the life-history of the particular mosquito and the best methods of attacking it.

(*e*) Factor of the social and economic condition of the people, etc.

(*f*) Plan of action recommended. The author rightly points out that such a plan of action must be drawn up with a knowledge of the financial and other circumstances of the locality, and it must be practicable to carry out.

A full account is given in Chapter VII of the symptomatology, pathology, and diagnosis of malaria, and some interesting charts are shown illustrating the course followed by an untreated attack of malaria in natives of India. We have noted an attack of quartan malaria, untreated, which showed six rises of temperature, these attacks of fever following one another regularly with two days interval, each succeeding attack being marked by a lower temperature. After the sixth rise no further attacks were noted over a period of three months. No quinine was given.

In the chapter on treatment the distinction between prevention of primary attacks and prevention of relapses is rightly insisted on, and the various methods are discussed.

It is also pointed out, and this is, indeed, an important point, that quinine is a drug which if it is going to do good at all does so quickly and, therefore, to give large doses of quinine to any patient with fever not definitely diagnosed malaria is wrong, and it is also wrong to continue giving large doses of quinine to a patient if the drug is having no good effect. Unfortunately, in the case of enteric fever, a large dose of quinine will reduce and even intermit the fever, thus encouraging the use of the drug with, as we have seen, most serious results.

In dealing with methods of prevention the author rightly insists on the necessity of using all methods available and not relying solely on one method, however important, such as the destruction of the larval stage of mosquitoes. Under certain circumstances this may not be feasible, and therefore every other method must also be exploited. Thus, the segregation and treatment of the sick is an essential precaution, also the protection of the healthy by means of segregation, by quinine, by nets, and the screening of houses.

The attack on the intermediate host by destruction of the adult mosquitoes, removal and deletion of breeding-places, destruction of larvæ and of the eggs, is also of the greatest importance, and a full description is given of the methods to be used. Here, again, the necessity of research, with a view to identifying the chief malaria-carrying mosquito, with a study of its habits, is again, and rightly, insisted upon, rather than the carrying on of a general campaign directed simply to the reduction of the numbers of all mosquitoes.

It will be seen, then, that this book is a useful and helpful one, and it can be recommended as a guide to those who are called upon to deal with malaria either at home or abroad.

D. H.

The Defeat of Austria, as seen by the Seventh Division. By Rev. E. C. Crosse, D.S.O., M.C. London, 1920: H. F. W. Deane and Sons. Pp. xv and 115. Price 7s. 6d. net.

Intended primarily for the 7th Division as a souvenir of their victory on the Piave, this book is worthy of a much wider circulation. The writer has accomplished the difficult task of giving due weight to the work of each unit without wearying the reader with a mass of detail. His account gives a clear idea

of the military operations, while the relation of individual experiences of officers and men adds a human touch. The book is well provided with maps and illustrations. There is not a dull page in it, and we hope it will aid in the worthy task of preserving the comradeship of those who fought and endured long months of discomfort together. W. R. G.

Correspondence.

HUMAN CARRIERS AS A FACTOR IN THE EPIDEMIOLOGY OF FOOD POISONING OUTBREAKS CAUSED BY *B. AERTRYCKE.*

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—An account of an outbreak of food poisoning, which occurred in No. 31 General Hospital at Port Said, was reported by Sewell, Smith and Priestley in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS for June, 1920.

Bacteriological investigation of the patients resulted in the isolation of the common type of *B. aertrycke* encountered in these epidemics—*B. aertrycke* "Mutton" type, but the source of the origin of the organism could not be ascertained, and its vehicle of transmission remained a matter of surmise.

The authors considered in detail the various articles of diet which might have harboured the bacillus. They mentioned briefly the possibility of food contamination by a human carrier, but dismissed this aspect in the epidemiology of the outbreak by quoting Bainbridge's statement that, up to the date of his work on the subject, no case of a human carrier of *B. aertrycke* had been described.

I think it is necessary, in view of the more recent work on the bacteriology of these epidemics, to emphasize the fact that more attention should be directed to the possibility of food contamination by human carriers of this group of bacilli. My experience, in the investigation of an important epidemic of food poisoning in France, is of interest in this connexion. The origin of this outbreak was almost certainly due to the contamination of food by a cook who had suffered from recurrent diarrhœa, and from whose stools *B. aertrycke* was repeatedly isolated. The duration of the period of infectivity was followed in forty-four patients convalescent from an attack of the disease. In one case positive stool culture was successful fourteen weeks after the date of onset of the illness, at which period the examinations were discontinued.

Additional evidence of the persistence of infectivity of convalescents is afforded by the findings of Fletcher, working at the University War Hospital, Southampton. He isolated an organism, identified as *B. aertrycke*, in three cases whilst making routine examinations of soldiers convalescent from diseases due to the dysentery and enteric group of bacilli. In two cases, nineteen and eight weeks had elapsed since the onset of the illness; in the third case the period of convalescence was doubtful, but the patient's temperature had been normal two weeks before admission to hospital.

It would appear that the greater percentage of convalescents rapidly cease to excrete the organism, but a few remain infective and lapse, in the same way as dysentery and enteric convalescents, into the temporary or chronic carrier

condition. These carriers serve as potential sources of infection, and must be taken into account in these epidemics—as in the outbreak under consideration—where the origin of the bacillus cannot be traced to the consumption of meat derived from a diseased animal.

Although the authors of the report mention that bacteriological examination of the cooks in the hospital kitchen was undertaken, the value of this investigation is discounted by the fact that stool examinations were neglected.

The absence, in the sera of these men, of a high agglutination titre for the infecting bacillus, brought into evidence by the serological tests, does not militate against the possibility of one of them being a carrier. The fact that the sera of many chronic carriers of the enteric and dysentery organisms fail to exhibit a high agglutinin content for these bacilli is a matter of common knowledge.

Whatever may have been the focus of infection in this epidemic, and I do not consider food contamination by human agency has been eliminated, I am of opinion that the more attention is directed to the possibility of *human carriers* of *B. aertrycke* in those outbreaks in which the consumption of diseased meat is excluded, the less will be the obscurity in their epidemiology.

I am, etc.,

H. MARRIAN PERRY.

Royal Army Medical College,
London, S.W. 1.
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FRAGMENTS.

BY COLONEL SIR ROBERT FIRTH, K.B.E., C.B.

I.

THOSE who read my articles[1] upon the Electron, Atom and Molecule, and upon Phantom Matter will understand readily this fragmentary contribution. Some fifty years ago, there was advanced a very important chemical theory known as the Periodic Law. Its main point was, "if all known elements are arranged in order of their atomic weights it is found that certain chemical properties recur at definite intervals." The scale on which the atomic weights are measured is such that the weight of hydrogen is taken as unity, but in practice, for technical reasons, it is more usual to take that of oxygen or 16, which is almost exactly the same thing. For the lower atomic weights the cycle goes with a gap of 8 between each element of a group. Thus boron and aluminium are both in the third group and numbered 5 and 13 respectively, similarly nitrogen and phosphorus in the fifth group are 7 and 15. But after two complete cycles the gap changes to 18 as instanced by strontium and barium, both in the second group, but numbered 38 and 56 respectively. Originally, the periodic table was very imperfect, and in consequence was open to much criticism, but the researches of recent years have filled in many vacant places, with the result that the periodic law holds now an important place in both physics and chemistry as bearing on the theory of the fundamental nature of matter.

It is well known that the resemblances of corresponding elements are sometimes not very marked, but they are sufficiently so to prove that

[1] Published in this Journal, June and December, 1914.

there must be some underlying principle, and this has enabled chemists to predict the existence of elements through the presence of a missing space in the table. To the physicist we owe the filling in of these vacant spaces. A commencement was made by the discovery of the rare gases of the atmosphere or a group of elements which are entirely inert and entering into no chemical combination. After a while, they were placed finally into a zero group of the periodic table. In this position, the six gases, helium, neon, argon, krypton, xenon and radium emanation constitute a missing link between the strongly electro-negative halogens and the strongly electro-positive alkali-metals, as their electro potential is both plus and minus. By this means a continuous line or series of the elements was formed when they were arranged according to increasing atomic weight. Then came the development of the electrical theory of matter, and Thomson's work which showed that all atoms contain a common constituent called the electron or a particle with a perfectly definite and constant charge of negative electricity, and having a mass of about one eighteen-hundredth of a hydrogen atom. By examining the dispersal or scattering of an X-ray beam when traversing matter, it was found possible to count the number of electrons scattered under definite conditions, with the result that it was found that the number of electrons in an atom was practically the same as half the value of the atomic weight itself. Subsequent work on the radio-active substances confirmed this conclusion. Radio-activity is the succession of transformations of a substance through a definite series of states, each state having all the properties associated with the term "element." In the act of transformation each atom throws off a high-speed particle, the particle being characteristic of the element which is changing. There are two different kinds of particle thrown off, known as α and β particles. The α particle is really a helium atom carrying a positive electric charge equal to twice that of an electron ; the β particle is an electron. Both particles travel at high velocities and have high penetrative powers, but the α particle is the more massive and the more penetrating.

These discoveries led to the formation of the theory of atomic structure which holds that an atom has a nucleus of very small dimensions carrying practically the whole of its mass and loaded with a charge of positive electricity equal to some multiple of the charge of an electron. This charge is neutralized by a group of electrons around it, and the number of elementary charges of electricity in the nucleus is the fundamental character which determines the chemical nature of the atom. Chemical processes, therefore, resolve themselves into the scraping off or detachment of one or more electrons from an atom. This work on the radio-active substances led further to the conclusion that the number of elementary charges of positive electricity concentrated on the nucleus of the atom gave the atomic number of a given element in the periodic table, and that

TABLE I.—The Table of Elements.

1	Hydrogen ..	1·008
2	Helium ..	3·99
3	Lithium ..	6·94
4	Beryliium ..	9·1
5	Boron	11·0
6	Carbon ..	12·0
7	Nitrogen ..	14·0
8	Oxygen ..	16·0
9	Fluorine ..	19·0
10	Neon	20·2
11	Sodium ..	23·0
12	Magnesium ..	24·3
13	Aluminium ..	27·1
14	Silicon.. ..	28·3
15	Phosphorus ..	31·0
16	Sulphur ..	32·0
17	Chlorine ..	35·46
18	Argon	39·8
19	Potassium ..	39·9
20	Calcium ..	40·1
21	Scandium ..	44·0
22	Titanium ..	48 0
23	Vanadium ..	51·0
24	Chromium ..	52·0
25	Manganese ..	55·0
26	Iron	56·0
27	Cobalt ..	58·7
28	Nickel ..	59·9
29	Copper.. ..	63·6
30	Zinc	65·4
31	Gallium ..	70·0
32	Germanium ..	72·5
33	Arsenic	75·0
34	Selenium ..	79·0
35	Bromine ..	79·9
36	Krypton ..	82·9
37	Rubidium ..	85·0
38	Strontium ..	87·0
39	Yttrium ..	88·7
40	Zirconium ..	90·6
41	Niobium ..	93·5
42	Molybdenum ..	96·0
43	?	
44	Ruthenium ..	101·0
45	Rhodium ..	102·0
46	Palladium ..	106·7
47	Silver	107·9
48	Cadmium ..	112·0
49	Indium	115·0
50	Tin	118·7
51	Antimony ..	120·0
52	Tellurium ..	126·9
53	Iodine	127·5
54	Xenon	130·0
55	Cæsium ..	133·0
56	Barium ..	137·0
57	Lanthanum ..	139·0
58	Cerium	140·0
59	Praseodymium	141·0
60	Neodymium ..	144·0
61	?	
62	Samarium ..	150·0
63	Europium ..	152·0
64	Gadolinium ..	157·0
65	Terbium ..	159·0
66	Dysprosium ..	162·0
67	Holmium ..	
68	Erbium ..	167·0
69	Thulium ..	168·5
70	Ytterbium ..	173·5
71	Lutecium ..	175·0
72	Keltium ..	?
73	Tantalum ..	181·5
74	Tungsten ..	184·0
75	?	
76	Osmium ..	191·0
77	Iridium ..	193·0
78	Platinum ..	195·0
79	Gold	197·2
80	Mercury ..	200·6
81	Thallium ..	204·0
82	Lead	207·2
83	Bismuth ..	208·0
84	Polonium ..	?
85	?	
86	Radium emanations ?	
87	?	
88	Radium ..	226·0
89	Actinium ..	?
90	Thorium ..	232·1
91	Brevium ..	?
92	Uranium ..	238·2

this number was practically half the atomic weight or a little less. In this manner it has been determined that the periodic table provides for ninety-two elements from hydrogen the lightest to uranium the heaviest, and moreover, that under present terrestrial conditions elements of a higher atomic weight than uranium cannot exist. The radio-active elements, therefore, indicate the upper limit of a periodic system. The next question was how many of the gaps remained to be discovered. This problem was solved by Moseley's work at Oxford upon the high-frequency spectra whereby he filled in all but three of the vacant spaces between aluminium, which is No. 13, to gold, which is No. 79, discovered a number of rare earths, and established their places as elements in the periodic table. The present position is that there are only five missing numbers, namely, those of atomic numbers 43, 61, 75, 85, and 87. The first three come between aluminium and gold; of these the first two are somewhat like manganese and would have atomic weights about 100 and 190, while the third is a rare earth with an atomic weight about 148. The remaining two are in the radio-active region, probably 85, being a halogen and 87 an alkali-metal.

In Table I the reader will find a complete list of the elements as now known. The figures in the upper line are the atomic numbers expressing the element's place in the periodic table, while the figures after each element are the atomic weights, both being in terms of hydrogen as unity. Radium, when discovered, fell naturally into the then vacant space No. 88, and the three radio-active emanations or products of radium, actinium, and thorium respectively, occupy the place No. 86. The space No. 91 is known to be occupied by a product of uranium, called brevium, because it has a period of average life of only $1\frac{2}{3}$ minutes. Thus radio-activity and the researches arising out of it has filled all but two of the last places of the periodic table and has even done more. It has crowded into ten of these places, that is between 81 and 92, no less than 39 other distinct elements. These do not appear in the list as there is no place for them, but, as elements occupying any one place they are called *isotopes*. These isotopes have different radio-active behaviours but the same chemical characters, and as such are quite inseparable by any chemical means. Ionium is isotopic with thorium, also mesothorium I with radium, and so on. To the spectroscopist and chemist they would be taken as one, but not so, however, to the newer methods of the physicist.

Reverting to the α and β particles, it is noteworthy that the expulsion of these particles from an atom leaves a new atom with properties different from the parent, but different in a very definite way. If it is the α particle which is expelled, the element after this expulsion changes its whole chemical character and passes from the place it occupies in the periodic table to a new place, next but one to it in the direction of diminishing atomic weight. If the expelled particle is a β particle, the change of place is invariably into the next place in the opposite direction. After three

changes in any order, one α and two β expulsions which is a very common sequence in the radio-active series, the element returns to the place it first occupied. Its atomic weight, however, will be and is less than it was by four units, but in its whole chemical nature and its spectrum it is not merely like its original parent, it is chemically identical with it. Those elements which so occupy the same group in the periodic table, and are absolutely identical in all their chemical properties, are the so-called isotopes. The periodic table is given in Table II, with the ninety-two elements arranged in their various groups. The places in the periodic table represent integral net charges of electricity in the constitution of the nucleus of the atom. Nature does not deal in fractions of an atom of electricity any more than with fractions of an atom of matter. As we pass from hydrogen to uranium, we pass ninety-two places in the periodic table, each element differing from the one preceding it by a unit charge or "atom" of positive electricity in its nucleus. Hydrogen has one such, and uranium ninety-two such unit positive charges.

If the weights of all the particles it emits during transformation are subtracted from the weight of a uranium atom, the result should give the weight of the end-product. It happens that there is a loss of eight α particles and some β particles. The weight of these latter is insignificant and can be ignored. Since the weight of each α particle is 4, the loss is 32, and the atomic weight of the end-product is therefore 238·2 less 32, or 206·2. If the same be done in respect of the sequence of changes of thorium, according to the α and β change rule, the atomic weight should be 208. In both cases the final product occupies place No. 82 which is occupied by lead, and the end-product is lead. Now the atomic weight of common lead is 207·2, and this suggests that common lead is a mixture of isotopes rather than a single homogeneous element. This is the accepted view, and the atomic weight of lead varies with the source. True, the difference is small but, roughly speaking, lead from thorium is $\frac{1}{4}$ per cent heavier than common lead, while lead from uranium is some $\frac{1}{2}$ per cent lighter than common lead. If such a difference occurred with gold, then the banker would be liable to be out by 1 to 2 sovereigns in every 400, if he relied upon weighing the coins only instead of counting them as well.

Having mentioned the golden sovereign, a coin we have not seen for some time, it is pertinent to ask whether these new discoveries advance us toward the goal of alchemy, and how to make gold from lead or mercury. If we look at the periodic table, we see that gold is followed by mercury thallium, lead and bismuth. To get gold, all we have to do is to expel one beta particle from the atom of mercury which will give us thallium, then to expel one alpha particle from the thallium atom which will turn the thallium into gold. Or, if we wish to get gold from lead, then we must expel one alpha particle from the lead atom which will turn it into mercury and proceed as before. This is very easy to write, but the

TABLE II.—THE PERIODIC TABLE.

0	I	II	III	IV	V	VI	VII	VIII
Helium	Lithium	Beryllium	Boron	Carbon	Nitrogen	Oxygen	Hydrogen	
Neon	Sodium	Magnesium	Aluminium	Silicon	Phosphorus	Sulphur	Fluorine	
Argon	Potassium	Calcium	Scandium	Titanium	Vanadium	Chromium	Chlorine	
	Copper	Zinc	Gallium	Germanium	Arsenic	Selenium	Manganese	Iron. Cobalt. Nickel
Krypton	Rubidium	Strontium	Yttrium	Zirconium	Niobium	Molybdenum	Bromine	
	Silver	Cadmium	Indium	Tin	Antimony	Tellurium	43	Ruthenium. Rhodium. Palladium
Xenon	Cæsium	Barium	Lanthanum	Cerium	Praseodymium	Neodymium	Iodine	
	Samarium	Europium	Gadolinium	Terbium	Dysprosium	Holmium	61	
	Thulium	Ytterbium	Lutecium	Keltium	Tantalum	Tungsten	Erbium	
	Gold	Mercury	Thallium	Lead	Bismuth	Polonium	75	Osmium. Iridium. Platinum
Radium emanation	87	Radium	Actinium	Thorium	Brevium	Uranium	85	

difficulty exists that no one knows how to expel either an alpha or a beta particle from an atom when they want to. Nature alone knows the method, and if she wishes to apply it man cannot prevent her. But suppose we did know how to do all this, would it be worth our while? I think not, because the energy liberated and available would exceed in value and importance the gold. Possibly it would pay rather to transmute gold into some baser metal, and once we knew how to handle all the energy involved in these transmutations, war would not be the drawn-out agony as known in our time, but the destruction of a group of enemy countries secured with a swiftness that would leave nothing more to be desired.

So much for the newer conception of the elements and their sub-atomic structure; it is worth thinking further of the distribution of these chemical elements. Some interesting work in this connexion has been done by Clarke.[1] He has estimated the distribution of the elements in the lithosphere or solid crust of the earth, in the hydrosphere or oceans and lakes, and in the atmosphere or gaseous envelope. If expressed as mere percentages the figures he gives are not very illuminating, but a new interpretation of them has been given by Hackh[2] who, by dividing Clarke's figures by the atomic weight of the individual element, arrives at the proportion of atoms concerned. Taking the most abundant twenty-five elements, he finds that the relative proportion of atoms was lowest for bromine, namely, 0·000125, and using this as unity the relative abundance of atoms of any given element is obtained by dividing the relative proportion of the atoms by 0·000125. These new values are given as follows:—

O	249,850	Mg	6,855	Ti	714	N	171	V	23
H	75,312	Ca	6,422	Cl	451	Mn	116	Li	22
Si	72,860	Fe	5,982	Fl	421	Ba	46	Sr	16
Al	21,528	K	4,660	P	283	Cr	46	Zr	13
Na	8,200	C	1,199	S	274	Ni	26	Br	1

The simple meaning of these figures is that for each bromine atom in the lithosphere there are some 250,000 oxygen atoms and 75,000 hydrogen atoms, while for each carbon atom there are about 250 oxygen atoms and seventy-five hydrogen atoms. It is significant that all the important elements have a low atomic weight. Furthermore, with the exception of titanium, the same elements all enter into life or the biosphere. Another point is that all the important and preponderating elements occupy neighbouring positions in the periodic system, while the few which are of high atomic weight are near the group of noble inert gases. It is curious to find

[1] Clarke: *United States Geographical Survey Bulletin*, C 16.

[2] Hackh: *Journ. of Gen. Phys.*, 1919, p. 429; also *Science*, 1919, p. 328; and *Journ. Amer. Chem. Soc.*, 1918, p. 1023.

that only hydrogen, oxygen, nitrogen and carbon are to be found in all the four spheres, that is, in the lithosphere, the hydrosphere, the atmosphere, and the biosphere. These elements constitute nearly ninety-nine per cent of all living matter; on the other hand, the quartette sodium, magnesium, aluminium, and silicon with their oxides form the basis of all rocks and are predominant in the lithosphere. Associated with, and next in frequency to, the foregoing eight elements are six others — namely, iron, lime, potassium, chlorine, phosphorus, and sulphur. These fourteen elements not only make the bulk of known matter, but also are the essential elements of every material science. It may be unwise to draw any conclusion from the facts, but it seems highly suggestive of a material evolution in the universe. Our earth is an integral although an insignificant part of the cosmos and as such must share in cosmic evolution. Can we say that the excess or abundance of certain elements on this earth is the index of a stage or state of evolution? We know that in celestial or stellar bodies there are indications of a stellar evolution going on; why should not the abundance of terrestrial elements indicate the earth's stage of evolution? We have no guarantee or evidence that the chemical and physical characteristics of what we call sodium or potassium to-day were the same millions of years ago when the earth was younger, or that they will be the same in the ages to come. The life on this earth is based practically on carbon. Are we to assume that it is the only possible one in the universe, and that a life based on silicon, aluminium or sodium cannot exist? Few will be inclined to affirm it, and so the riddle remains.

II.

The intellectual world has been perturbed by a so-called new theory of relativity. It is not easy to understand, and is very difficult to explain without reference to mathematics. I am not competent so to explain the theory but, in its broadest aspects, relativity is based on the assumption that all measurements and observations reveal only relations between the observer and the object observed. In the domain of physics it is based on the complete absence of experimental evidence that any optical, dynamical, or electro-magnetic effects arise from the motion of matter relative to the æther or space in the absolute sense of the word. It is a common conception that the earth, sun, and stars are floating, completely immersed in a sea of space; and the modern theory of relativity says that we neither know, nor can ever know, how great or how small may be the velocity with which the earth or the stars move in that space. Velocity has to be expressed in some such units as miles per hour, and the miles covered by the moving body in a unit of time have to be measured from some definite point in space. But space is featureless; hence, velocity in space is meaningless until some points in space have been named which may be regarded either as fixed or as moving in some definite way relatively to

space. Hitherto velocity in space has been measured relatively to the so-called fixed stars, but these same stars are only fixed because they are so far away from the earth that we cannot detect any change in our distance from them.

But to featureless space, commonly called the æther, has been attributed the property of transmitting light at a definite velocity, and it is remarkable that the velocity of light is the same for all directions of travel. It is difficult to reconcile this latter fact to the idea of an æther as we have conceived the æther to be. It is tantamount to saying that a man can swim up stream with the same velocity as he can swim across it, which is contrary to all experience. If the earth is moving through the light-conveying æther and the velocity of light relatively to this æther is fixed and always the same no matter what the direction may be, then the only explanation possible is that the eventually perpendicular paths along which light travels in equal times are not in truth equal paths. That is, the up-stream path through the æther must actually be shorter than the cross-stream path. The amount of any contraction, if it actually occur, can never be detected or measured because both the measure and the thing measured suffer the same contraction. Conceivably, therefore, our velocity through space may be so great that a yard-measure lying north and south may contract to any length when laid east and west.

Explanations of most scientific phenomena are sought in terms of the motion of particles of matter. The complete history of the motion of a particle in space can be recorded by stating its exact distance from, say, the floor, one end wall and one side wall of a room at a sufficient number of moments of time. In such a case three intersecting lines representing respectively the length (x), the height (y), and the breadth (z) of the room will be called the frame of reference in relation to which the position of the particle is defined. These axes, x, y and z, are mutually perpendicular and make possible the exact definition of the position of the particle in three-dimensional space within the frame of reference of the walls of the room. If against each of the points representing the consecutive positions of the particle in space we imagine the time at which the particle occupies this position to be written, we obtain a complete record of the motion of the particle in space and time. In order to simplify the recording of the consecutive positions in time, it is usual to speak of a fourth axis t, supposed to be perpendicular to x, to y, and to z, along which the position of the particle in time may be measured. It often happens that observations are being made upon an object by several different observers with reference to whom and their respective frames the object has different relative velocities. Now intelligible comparison between the observations made by the various observers can be made only if the differences in their velocities relatively to the observed system can be properly allowed for. Let us imagine that two observers S and S′ are observing the same object from different positions. The new theory is an attempt to explain the connexion between the spatial and temporal measurements of the observers in the system S and S′.

Leaving out the mathematics, if the S observers measure the time of an event idealized by them as instantaneous to be t units of time after a chosen original instant, and the place of its occurrence, which is idealized as a point, to have co-ordinates x, y and z, relative to their fixed frame of axes, then the S′ observers will record their observations of the same event with time and space co-ordinates t', x', y', z', the same being fixed relative to them. Mathematically, the equations connecting these eight quantities are a set of four linear equations. Certain consequences follow from the solution of these equations; they are (1) The dimensions of a body are not the same to observers for whom it is fixed as to observers for whom it is in motion; that is, bodies or objects are shorter to observers past whom they are moving in a direction parallel to the motion. (2) If two events occur at a locality, the time interval between them is not the same to the observers S and S′; that is, all periodic mechanisms appear to go slower to observers in relative motion to them than to observers at rest relative to them. (3) A group of observers regard an event which occurs at one place as simultaneous with another event which occurs at another place, these events will not be regarded as simultaneous by any other group of observers who are in relative motion to the first group. There is nothing in this to contradict any impressions made in the mind of a single observer as to the time relations to him of two events that come under his own direct observation.

To the astronomer and physicist, these newer conceptions of the law of relativity are of the first importance as they transform the mathematical equations for some complex physical phenomenon when expressed in terms of measurements made in one frame of reference to a simpler mathematical form when expressed in terms of measurements made in another frame. The point to be specially observed is this, that since, according to the theory of relativity, we never can measure velocity relative to the æther, we must allow ourselves to assume that any desired frame of reference, arbitrarily chosen for convenience, is at rest in the cosmos or in an æther, and thus calculate the velocity of some other frame of reference relatively to the one we have fixed. The transformation obtained then involves only the relative velocity of the frames. It is for this reason that the theory is called "relativity." A simple illustration will give some idea of the bearing of the newer conception on the problem of phenomena in the neighbourhood of a single gravitating centre. Observers moving in any path under the action of the centre would observe that the paths of all bodies in their immediate neighbourhood would for the time being be straight, because both observers and bodies would be experiencing the same acceleration towards the centre with reference to axes whose origin is at the centre. Obviously, more distant bodies would not be moving in straight paths relative to the observers because the accelerations are different in different parts of the field, and the bodies adjacent at the moment would in time separate from the observers and consequently lose

the property of rectilinear motion relative to them. For proximate bodies, the frame of reference natural to the observers is one in which motion is the simplest possible, that is uniform, and the frame is equivalent to one in which force is absent, and the gravitation of the centre is transformed away by choosing axes of length and time. By this a simple equation for an element of an orbit is obtained. By replacing our measures of time and length by those made by an observer fixed at the centre and to whom we are in relative motion, and by using the relativity equations which hold at the moment, we arrive at the equation of the orbital element for this observer. On the principle of equivalence, it is postulated that to moving observers a ray of light *in vacuo* has also the simplest path in their vicinity, that is straight, and, by the same laws of relativity or transformation, it is curved in any fixed frame of reference, a result confirmed by the recent Eclipse expedition.

In plain language, the velocity of light in a gravitational field would not be constant, and consequently a ray of light passing through a gravitional field of varying intensity is refracted just as light is refracted through a lens on account of the difference of the velocities of light in air and glass. In its practical application, the new theory demands that mathematical devices be used whereby a straight line is imagined to be bent and a plane surface curved. The new theory explains gravitation in terms of motion of the frame of reference, and can be illustrated by the example of a lift. If that lift be falling freely, the frame of reference would be the framework of the lift, and those in the lift would be in a space freed from gravitational action or rather gravitation would be represented by an acceleration of the frame of reference. For accuracy, the lift must be conceived to be of very small area, in which all the lines of gravitational force are parallel. On a flat earth, gravity might be explained away in terms of acceleration of the frame of reference, and consequently be said not to exist. But our earth is not flat, therefore mathematical devices have to be introduced to explain gravity. In the case of our hypothetical lift, if a ball be thrown horizontally across that lift when it is at rest, the path of the ball will be a parabola, but when the lift is falling freely and the frame of reference accelerated, then the path of the ball thrown horizontally across it would be a straight line. Thus, a straight line becomes a parabola when a gravitational field is introduced and the gravitational field is said to distort space and introduce error into the Euclidian geometry of our youth. I ask pardon from the reader, for I fear that these explanations do confuse rather than explain. Anyhow, it seems probable that the theory of relativity has come to stay, though its effect upon either the theory or practice of medicine is remote. At present there stand to its credit a correct quantitative explanation of the variation of the mass of an electron with its velocity, the satisfactory reconciliation of optical experiments in aberration, and the prediction of the refraction or bending of a ray of light in a gravitational field.

As regards the effect of the new theory of relativity upon Newtonian transformations, it may be said that the legitimacy and accuracy of the Newtonian principles are obvious and, for all ordinary problems, their practical application can be made in a way which shows precise agreement between all observers. But in some unusual cases, such as those of electrons in which relative velocities approaching the velocity of light have to be observed, application of the Newtonian transformation has led to discordant results. The theory of relativity has been able to explain these discordant results by showing, not that the Newtonian principle is wrong, but that it is inapplicable to the results of practical measurements because the quantities we measure are apparent distances and times, and the Newtonian transformation is applicable, of course, only to true distances and true times. When explained in terms of the æther, the theory of relativity says that no experiment ever can detect motion relatively to the æther, and consistently with this, it says that every observer carrying with him a source of light will, as a matter of convention, assign to light the same velocity relatively to the source and also to the æther that every other observer, moving or not, assigns to it. However, the theory of relativity is not dependent on the existence or the non-existence of one unique æther, and if the latest facts as to the bending of a stream of light and its uniform velocity in all directions seem inconsistent with the conception of a unique æther, it is quite permissible for us to elaborate the æther idea by supposing every source of light to have its own æther fixed relatively to it.

III.

If the reader has struggled through the foregoing attempt to explain a fragment of the newer knowledge he will, doubtless, be convinced that there is a new theory of the universe and, if he be without mathematical aptitude, is possibly racking his brains to form some visual picture of the new cosmic regime. In case he does not discover it for himself, I suggest that he look at the world and society around him, and that to become initiated in the newer knowledge all he has to do is to abandon the habit of visualizing. Perhaps he is too old or too lazy to give up old habits and take on new ones; or, may be like myself, he is making heroic efforts and just as he sees victory within grasp, he finds himself tripped up by the old atavism and left reflecting intently upon nothingness.

Together, he and I can resolve to behave like men of the world; and even if we are unable to understand the new world, the new people, and the new ways, we can at least be cynical and cover our cynicism with the plausible pretence of having some respect for cosmic decencies. The gist of the theory of relativity seems to be that space creates its own times and distances, and also its own matter. What are we to do? We, who stand for law and order, fortified with a Greenwich meridian and a Greenwich mean time! Truly, the world is topsy-turvy, and the outlook is bad if the

universe is to be run by millions of Soviets each creating its own space and time, and with each of which we must readjust our frames of reference. On the other hand, from chance scraps of knowledge or information as to normal velocities prevalent in space and feasible to calculate for those who can establish relativity with the occupants of space, the prospect opens up some possibilities especially by way of making excursions. For instance, are we not within hope of being able to make a circular tour with the velocity of light to regions little dreamed of under our former philosophy, and, moreover, be able to return therefrom but a few minutes older than when we started? On such an expedition there will be no need for worries as to exceeding the speed limit, for the law of Nature forbids it. In some distant star, and after having established a new frame of reference, we shall be able to pass a little time in observing what is going on and probably be able to crowd into a few seconds some experiences which take many years of our time. Of course, with such superlative excitements there may be superlative dangers, not the least being perhaps an inability to come back, or even to return to one's home only to find that every other living thing on the earth had disappeared as the effect of a new glacial epoch. Possibly the new universe without shams and pretences is more adapted to life without pretences than our old regime. Life on this mundane sphere is just now rather overloaded with pretences. We set our watches by Big Ben and pretend that it is five when we know that it is only four o'clock. By so doing we catch our trains and get home in time for dinner, but the material clock that chimes and strikes the hours awakes no echoes within us. The time we really care about and the timepiece by which we set our lives is a far more individual affair.

I know a man of so optimistic a temperament that he maintains that the secret of life is the power to see that one's local time is everything, and that of Greenwich to be negligible. To him, local time is nothing but the relation between events of importance, and by these latter he makes his co-ordinates both as to time and space. To my friend and to many others, life consists not in a sequence of events unrolled through the years, but in the sudden upward leaps of the individual human spirit. It is all a question of sine and co-sine, of plane and angle whereby an unexpected side glance at life may, and often does reveal a new unity. If this be true of life here, why should it be otherwise with the universe? The man who sleeps under a hay-rick may be a good-for-nothing, but he gets a better sight of the stars than the man who sleeps under a roof, and so it may be with the author of the new theory of relativity. He has seen a way by which reality could be taken in flank, and has not hesitated to question what was thought to be an unquestionable thing. This is a trait of all those who have seemed to steer that frail bark called humanity. The humanity that sets its watch by the Big Bens or by the local station clock is slow to obey the helm. The people who live by their own or individual time are often dull and impractical or even unconventional but

test them by what they achieve and comprehend, and they will be found to make those who adjust themselves by the station clock or by the Big Bens to look absurd. The lesson is, that Relativity, like Charity, begins at home, and that the timepiece within us is the safer guide by which to plan our hours and days.

IV.

Listening to the talk of some young men in a train, a few days ago, I could not help recalling Johnson's opinion that "words mean what they mean and no other sort of thing," and wondering to myself whether language, with other arts, is not going astray towards the meaningless owing to the modern passion for novelty. We are familiar with a school of painters who, seeking to achieve something new, take refuge in distortion and the misuse of colour. In the hands of a genius, the endeavour is interesting but with the mediocre it becomes but a fashion being, in aspiration, on a level with a woman's delight in some novel contortion of dress. There seems to be a tendency in these days, not less demoralizing than the tricks of decadent painters, to make use of outrageous verbal expressions. These really are misapplied words and not new epithets born of new circumstances. There is no such fact as an old beauty or an old truth because those things are always of to-day. The modern misapplication of words involves an irreparable loss because the beauty and grace of words which have served as a real purpose in our language are undergoing a disfigurement which may cause our losing the very meaning of what are really valuable assets.

If so, then those who love our language or appreciate its beauty and strength should insist that the misapplication of words, however cunning in its wit or in its apparent fitness, is a cankerous growth which withers where it attacks. Words that mean what they mean remain in a vocabulary through the ages and make explicit for generation after generation the significance of things valuable to the heart of man. On the other hand, the construction or dressings of language, the pronunciation, the colloquial idiom and the meaning of terms not of fundamental importance, change and are evanescent. Language may change or be enriched by new words but the isolated words of primal significance remain meaning what they mean and no other sort of thing. Who can deny that words in themselves are beautifully comprehensive? The phrase may cheat but never the word. Nothing that we can add to the utterance of the old Saxon word "God" can enrich the real significance of its meaning, but much can belittle it. Who can find better synonyms for such words as land, home, mother, child, love, hate, joy, evil, flower or ship? These are all words that call for no sentence to accompany or explain their meaning.

It is well known that both in ordinary conversation and in literature special words take to themselves a sudden importance in the mouths and

fingers of individuals. I am conscious that I myself have a tendency to use certain words which dominate without producing actually a sense of repetition. I have noticed the same in others, and it would almost seem as if certain words insist upon coming back to us and the mind plays upon their extension into phrase and their reabsorption. Possibly, it is all the result of subconsciousness, but it does not invalidate the argument as to a real danger to our language by the thoughtless misuse of words at the present time. I plead for the view that the infinite meaning of one word does bring to us the delight of language, and that the properly applied word gives an inspired message, an explanation, an emphasized assertion and a detailed description which is both poetry and prose, enabling us to live more intimately with the significance of the symbol which that word is. We are all proud to have inherited and let us be anxious to enrich, to keep pure rather than to impair, the instrument which served a Shakespeare, a Milton, a Bunyan and a Wordsworth. Every language has its anomalies but every language has likewise its improprieties. The line between an anomaly and an impropriety is not perhaps easy to draw, but let us be mindful of their existence, be heedful of the warning and be encouraged to persevere in withstanding their baleful influence upon the language which should be our pride. Too frequently, the world is satisfied with words; few care to dive beneath the surface. As Isaiah said, "Woe to them that call evil good and good evil."

MILITARY CONVALESCENT DEPOTS IN FRANCE DURING THE GREAT WAR.

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(*Concluded from p.* 202.)

We arrive now at the consideration of, undoubtedly, one of the most important influences at work in the matter of benefiting the mind of the average convalescent patient; one which depended upon the means at hand of providing entertainment during leisure hours, and particularly that period between supper and bed-time which in winter would otherwise have dragged on so long. The means for this did not vary much in different depots, and consisted chiefly of brass bands and orchestras, and cinemas and concert party entertainers. The important work of these was fully recognized by the authorities. Hence, it was not surprising to find that the finally authorized establishment of personnel of a fully constituted convalescent depot allowed thirty bandsmen and entertainers as a permanent nucleus towards the formation of such pleasure-making concerns. A similar number was allowed to be recruited as temporary personnel from the ranks of the patients themselves and in accordance with the previously described system of patient employment. The value of bands and orchestras could not be exaggerated, and every depot was justly proud of them. Some even did not rest content with a brass band only, but possessed a fife and drum, and a bag-pipes band as well. These were usually kept very busy, since they were employed on all and every possible occasion; such, for instance, as upon route marches to and from the ground where physical exercises were daily undertaken, to the station when large bodies of "fit" men left the depot to entrain for their base depots, and finally, in the depot grounds themselves, or near neighbourhood, when band selections were deemed advisable by way of entertainment alone, or in conjunction with a sports meeting or ceremonial parade. The orchestra, on the other hand, consisting of brass, stringed and reed instruments, was reserved for special occasions, and provided concerts of itself, or aided at the performances of the concert party, or else played dance music whenever the men sought amusement in this direction.

Concerning the true value of concerts and concert party entertainers one could very readily write volumes. At the same time it would be difficult to exaggerate their influence and merit. At base depots as no less in the front areas their existence was proved to be invaluable. They afforded necessary relaxation of mind for the "Tommy," and served to turn his thoughts away, for the time being, from the horrors, discomforts and monotony of war. In the convalescent depot this form of entertain-

ment was greatly encouraged, and every facility given the performers to make their displays as bright and attractive as possible. As might be surmised the style of performance usually approximated to that of the music hall idea, where individual talent could appear at best advantage and provide a variety of "turns" such as delight the mind of the average soldier. At special seasons, notably at Christmas and Easter, concert parties did not hesitate to blossom out into company artistes and present pantomimes, which, though usually of a well-worn character, often outrivalled, if not in stage effects, certainly then as regards rough humour, the more orthodox efforts of their civil brethren. As a rule the large dining hall served as a concert room, and herein a permanent stage and proscenium were erected; with footlights, curtains, scenery, and an orchestra playing in the auditorium it was not difficult sometimes to imagine oneself sitting at a good-class London or provincial music hall. Talent was generally readily forthcoming and the party usually included one or two "professionals" of civil life. Hence in the matter of make-up, and the manifold tricks and artifices of "putting it across the footlights" there were no two ways about it; an actor either "made good" or "got the bird" according to the merit, as assessed by his comrades, of his own individual efforts. A "female" impersonator, who either sang in a high falsetto or danced gracefully or gawkishly according to "her" degree of ability, was an essential and constant member of every concert party. In addition there were the tenor, the baritone, the bass, and one or more comedians, some or all of whom could indulge also in concerted items or short sketchy acts, humorous, dramatic, or otherwise. Such performances were of almost nightly occurrence, and one was wont to leave them feeling that the evening had indeed passed merrily enough.

In addition to these entertainments of a local character, mention too must be made of the periodical visits of "Lena Ashwell Concert Parties," a most excellent institution carried on under the auspices of the Y.M.C.A., and greatly appreciated by all troops on the Lines of Communication and at base depots who happened to have the opportunity and good fortune of attending the concerts. They were usually mixed companies of from six to eight ladies and gentlemen, all of whom were personally chosen by Miss Lena Ashwell for special ability in their various accomplishments. As a rule such a company of artistes exerted a tremendous influence upon its audiences, and, as regards the convalescent patient, served to take his mind altogether off the war, and to bring him in touch with softer influences and memories of his home life in England or other country whence he came.

Lastly, the authorities of some convalescent depots, in their desire to provide easy and congenial entertainment for their men, bought whole cinema plants and set them up in their dining halls. The money for this outlay was provided out of depot funds, the whole sum in the course of a very short time being easily recoverable by means of the receipts taken at

each performance. Such receipts too were dependent upon a mere nominal charge of a penny or twopence as prices of admission. Changes of programme were effected twice weekly by means of an arrangement whereby the depot subscribed to a circulating library, controlled by a service of the Army itself or some Parisian firm of film-makers.

The popularity of such an entertainment need not be described. Suffice it to say that wherever there was a Cinema available for soldiers, thither they flocked.

To sum up now the effects of these concerts and other entertainments upon the convalescent patient, one might say that they taught him, whether the prevailing influence was one of sentiment, sentimentality, humour, callousness or even irresponsibility, to maintain, and perhaps even to regain, his wonted spirit of cheerfulness, his indifference to his fate, his belief in the justice of his cause, and finally his determination to see the business through, and, whilst doing so, to get the best out of his present mode of life and circumstances. That he was resolved to place a bold and cheerful front upon his future destiny was plainly evident from an observation of his conduct and bearing upon that day when, again physically and fighting fit, he marched off to the station along with his fellows to the stirring notes of the brass band, and with swinging step, his head up-lifted, a smile on his face, and a joke on his lips, he dared all and sundry amidst his passers-by to answer aught but "No!" to his famous sally "Are we down-hearted?" Many such left the depot grateful for the efforts done to make them comfortable and happy, and not a few of them converted into real and active propagandists on behalf of the merits of such an institution. In the latter way the fame of individual depots was spread throughout France and Belgium wherever soldiers happened to be, and particularly the Front areas; consequently very often when a man became a casualty, if it was not a question of his luck of reaching "Blighty," it certainly resolved itself into one of which convalescent depot he should be fated to attend.

Let us pass now to a consideration of the physical influences at work upon the convalescent patient. Previously mention has been made of the necessity on the part of the authorities of providing, not only convenient and congenial, but also healthy sites in their choice of areas for the establishment of convalescent depots. For the most part these sites were near the sea, enjoyed pure and bracing air, and afforded the many opportunities of health-giving exercises and pastimes connected with such seaside places. Not the least of these was sea-bathing, and in the warm summer months it was no unusual sight to see thousands of convalescents partaking at one and the same time of the delights of this healthy form of exercise. But apart from such a setting, however great the influences of such might have been, there were the direct influences of work and play upon the physical welfare of the patient, and these proved undoubtedly the greatest factor and the most beneficial asset in the curriculum of his daily life towards the recuperation of his bodily strength, and the regaining of his sense of well-being.

Let us deal firstly with that form of bodily exercise, of which all convalescent patients at some time or other during their stay in the depot were obliged to partake. It was rightly termed "physical and recreational training." It was placed directly under the charge of an officer, usually a regular and of the rank of captain, and in most instances a graduate of the Army Gymnastic Staff Corps. He had as assistants personnel in the shape of two or more serjeant-majors instructor, and usually not less than twenty serjeants instructor, these being either graduates of the same peace-time institution, or else, as among the lower grades, men drafted from regiments on the line, and after a course or two of training passed as proficient for such an occupation and transferred for duty to the Army Gymnastic Staff. As previously noted a convalescent depot counted on its list of permanent personnel the above-mentioned staff of physical training instructors. Their work was both important and arduous. Not only had they to act as instructors in the ordinary routine of physical training, but also they must needs interest themselves in and encourage every form of sport and physical activity in the depot, the latter at times including even morris and country dancing as well as that of the ordinary kind. The instructors were allotted for this duty equally amongst the several companies, and upon their shoulders fell the responsibility of encouraging their men to enter for all the various forms of monthly competition in sport, and by so doing promote the spirit of competition and healthy rivalry throughout the whole depot.

Physical training in itself was no hard-and-fast dull routine of daily exercise, but for the most part appealed to the sporting instincts of the men. It resolved itself into nothing more nor less than a series of amusing games interspersed with more serious periods of disciplined exercise of both mind and body. A morning of such training was usually spent after the following fashion. Those patients, who were not required for divisional or depot employment or the usual fatigue duty, were paraded appropriately dressed for the occasion, that is to say, minus their belts, gaiters or puttees, in their separate companies and divisions under charge of their physical training instructors, and ready to march off at nine o'clock in the morning to their training ground. The latter was situated at a variable distance from the depot, but usually allowed of a route march of a mile or two either way. One or more bands accompanied the long column of 2,000 men or more on the march, and served to keep them in ordered formation. Having arrived at the appointed spot chosen for exercise the column was broken up promptly into small groups, each under the supervision of an instructor. Now began that system of physical "jerks," games and exercises, that became so well known and established throughout the whole British Army. A man was expected to do only so much as his physical condition allowed, but very often he set off in the morning, expecting to do very little, only to find himself unconsciously exercising himself to the fullest extent and unable to resist the fun and frolic and

mental attraction of that cleverly thought-out system of games and exercises. Then, too, the bands playing at intervals their varied selections of music greatly added to the general cheerfulness of the occasion. It might be imagined by some sterner critics that a performance such as this, in which cheerfulness and even a touch of hilarity proved the predominant note, was not conducive to the acquirement of that spirit of discipline necessary amongst such large bodies of men. They would be wrong, for actual experience demonstrated that men, so exercised, proved more amenable to discipline, and readily turned from the free and spontaneous expressions of their enjoyment to the willing and sober performance of what might be classed more military actions and duties. It is granted, however, that the attainment of such perfection depended primarily upon the personality and efficiency of the officer in charge of such recreational training. He must needs be a real student of human nature, indeed a psychologist conscious or otherwise, and not only possessed of a real knowledge of this adopted system of army training, but also of the powers of leadership and command over men, of sympathy, tact and firmness, and above all of a sense of humour in keeping with that of the men themselves, and capable of overcoming difficulties or restoring, whenever occasion demanded, jaded and flagging spirits. Such an officer had usually risen from the ranks himself, had gone through the mill of pre-war dicipline and training, had seen active service at the front, and had in fact seen and done more than any of those men he had been called upon to instruct. His own enthusiasm and spirit generally pervaded the atmosphere of the whole depot, and he kept ever in close contact with the men, urging, encouraging, and, if necessary, goading them on, whether it was in work or play, in their entertainments or their festivities; nor did he rest content with this but gave advice and help to many an individual out of the store of his own personal knowledge acquired from long and useful military service. At his word of command one has seen a laughing, shouting tangle of men turned into a sober, quiet and well-ordered parade standing to attention and awaiting almost eagerly, their next order. At mid-day as the troops marched into camp again after their morning's exercise their demeanour of pride and good discipline was well displayed as in turn the men of each Company obeyed the order "eyes right" to their commanding officer, who stood at the saluting point critically examining the results of that morning's work. And sometimes as he stood there the thought struck him, "are these indeed the same men who but a few weeks previously arrived at the depot dirty and unkempt in appearance, with depressed spirits, and with their bodies weak and bent from the results of wounds or maladies?"

Apart from this enforced routine of physical training during the mornings, a routine carried on even in wet weather by making use of the large dining halls as shelter, the afternoons were given over to all forms of voluntary sport. Their different nature has been touched upon

before, and also the fact mentioned that each sport took the form of a monthly competition amongst the various companies, the winner acquiring as trophy a cup or shield. The commanding officer usually presented the latter at the close of the monthly competition at some gathering of the men, such as a concert or other entertainment. The enthusiasm with which the winning of each trophy was received not only by the successful company or division but by the whole depot spoke well for the spirit of good sportsmanship that prevailed. Moreover, it encouraged the unsuccessful ones towards greater efforts and determination to win in future competitions.

As regards the relative popularity of the various kinds of sport, it must be confessed that football, chiefly of the Association code, easily held first place in the estimation of the men. In fact, it is no uncommon knowledge that, given a football, a few leisure hours, and an open space of ground, a number of soldiers could easily find sufficient occupation, exercise, and full enjoyment. So, in convalescent depots, this sport claimed the attention of the greater numbers. Besides the hundreds of inter-company games that took place during the course of the monthly competitions, there were also inter-divisional, and even inter-depot matches played, at which there were large gatherings of interested spectators from the surrounding area. During the progress of these games partisan feeling ran high, though invariably it was in keeping with the good sportmanship and good fellowship of all present.

After football came boxing, tug-of-war, and hockey, in order of appreciation, but there were found devotees of almost every form of sport from the baseball of the Canadians to cricket, basket ball, or even less strenuous bowls. Mention, too, must be made of long-distance runs, which took place monthly, and usually on the neighbouring roads over a course of about three miles. For this, enthusiasm had generally to be worked up a few days ahead of the appointed day of the race, so that as many men as possible from each company might be encouraged to take part, even though they were unable, and not expected to run the whole distance. As a result, it was surprising the large numbers that actually took part on the day of the race, as many sometimes as two thousand or more, and whether these ran, walked, or hobbled the whole distance did not materially matter, since, by a system of giving points to the winning company for attempted endeavour rather than actual skill and practice in running, that company invariably proved the winner that possessed the greatest number of starters in addition to the greatest number of triers. To the actual placed men in the race, that is, to the first, second, and third, small prizes were given by way of encouragement and reward.

During the summer months it was the custom to hold occasional athletic meetings, and herein team-racing as well as individual effort were catered for. They proved, without exception, most popular gatherings,—the whole area as a rule attending—and they bade fair to rival almost in

every respect, even to the presence of the gentler sex in the shape of nurses, V.A.D. ladies, and the French inhabitants of the locality, similar club gatherings in England during the days of peace.

Naturally for so large a body of men, and for such a variety of games, a huge assortment of sporting articles and equipment was essential, such, for instance, as footballs, football-nets, and hockey balls and hockey sticks, cricket sets, boxing gloves, basket balls, and not to mention sporting kits, such as running singlets and shorts, football jerseys and boots. These were obtained for the most part by application to the British Red Cross Society, as likewise by private purchase from depot funds, the latter having been acquired in the form of donations from interested and generous visitors to the neighbourhood, or else from the Government purchase of dripping derived from the boiling down of the waste fat of the depot.

The Administration of other Depot Departments.

No description of the convalescent depot would be complete without further mention of all those subsidiary departments, namely, the dental, bath and laundry, dining hall, pay, shoe-making and tailoring, barber's, fire brigade, police, quartermaster, general maintenance, and orderly room, all of which formed an essential part in the complete machinery of depot administration. It will serve, then, to take each of these several departments separately, explain them, and show in what way their activities become correlated to the work of the depot as a whole.

Dental Department.—This Department was placed under the supervision of a qualified dental officer, assisted by two experienced mechanics. A dental surgery fitted with all the necessary appliances was allotted for the purpose. The work undertaken consisted of extractions, the filling of teeth, and the fitting of new dentures, and although perhaps bordering slightly on the style of "rough and ready" dentistry, it, nevertheless, served most efficiently from the military point of view. The condition of the average soldier's teeth in the British Army was by no means good (statistics placed dental unfitness as high as seventy-five per cent), and it was soon recognized, especially after conscription came into force, when men were enlisted without regard to this side of their medical fitness, that dentistry, even though of a mere patching-up variety, must needs play an important part in the medical treatment of those on active service. Nor could any better place for treatment have been chosen than in the large convalescent depots, where the men not only remained some appreciable length of time, but where they had more leisure and were free from the vagaries and uncertainties of Front area work, and thus were enabled to receive the best attention. This arrangement, however, did not exclude the usefulness of dental establishments elsewhere, such as at base depots, and in connexion with general hospitals and casualty clearing stations, since work begun in one place, for example, the fitting of new dentures, could be completed in the next and this without causing delay, and hence

wastage of strength to the Army. Keeping the latter fact in mind, the medical officer of a division in his usual routine of early examination of new arrivals picked out all those in need of dental treatment, and sent them straightway to the dental surgeon to have their wants duly attended to. In this way they were practically assured of getting all requisite treatment even to the fitting of new dentures during their limited stay in the depot; but should they by any chance have had to leave before completion of treatment, they were always safeguarded on being sent to their base depots by being placed in the category of those requiring further dental treatment.

Baths and Laundry Department.—In the front area the British "Tommy" as a rule had not the facilities for washing and drying his own underclothing. Hence, recourse had to be made to divisional baths and laundries. Here, on an average of about once a month the men had baths and were supplied with a change of clean underclothing. Not so in the convalescent depot. In this place facilities for proper cleanliness were amply provided and hence more was expected of the patient in this respect. He was obliged to partake of a hot shower bath once a week, and at the same time to provide himself with a change of clean underclothing, and a system was worked out for the whole of the patients and personnel whereby each could and must avail himself in turn of the wash-houses and drying-rooms provided for the purpose. Furthermore, before being washed all dirty clothing had to be thoroughly fumigated, since, by no other means could a check be put upon the prevalence and spread of vermin amongst large bodies of men grouped together in continuous close contact with one another.

Dining-hall Department.—The providing and serving of three meals a day for 5,000 men was in itself a very large undertaking. Dining-halls were provided to accommodate 2,500 men, which consequently necessitated two successive sittings for each meal. To each dining-hall were adjoined a cook-house, larder, butcher's shop, food preparing and washing-up rooms, the whole conforming to a system that minimized labour and facilitated the serving of hot and well-cooked meals to the men.

It was generally agreed that a well-fed soldier was invariably a contented one, and that should trouble arise its cause could readily be traced to some department of the commissariat. Hence the great importance of strict and constant supervision of this department on the part of the authorities. The food provided was the ordinary army rations, and not hospital diet. Consequently, those in charge were responsible for presenting this food in as palatable and varied a form as possible, at the same time having due regard to economy. In order to make the men realize that everything possible was being done for their welfare, a Messing Committee, consisting of the quartermaster, his subordinate assistant the quartermaster-serjeant and two or three convalescent patients nominated from each division, was appointed. This Committee met daily

for the purpose of arranging the menu after due consideration of the rations available.

This scheme of organization for the efficient carrying on of this department depended upon the following principles. Divisions fed separately, were served by their own appointed staff, had as far as possible menus differing daily from one another, took part in a monthly competition for efficiency, which was made to embrace proper cleanliness and regularity, and above all attempted to avoid any grounds for complaint on the part of the men on the score of insufficient or badly-cooked food, or the serving cold of intended hot meals. In this way a good deal of trouble was naturally avoided, but this itself did not suffice. It was the fixed duty of the orderly officer of the day to inspect all meals, kitchens, and food-preparing rooms, and to listen to all serious complaints whilst the men were actually partaking of their meals. He had power to deal at once with the source of complaint, and, if the complaint were justified, to order adjustment of it, and, if unable to do this, report the matter at once to his commanding officer. Such meticulous care brought its own reward, for it meant that half the battle was already won in bringing contentment of body and mind to the vast majority of men throughout the depot.

Before concluding a description of this department, one must not omit to make mention of a side issue, namely, the fat extraction plant. This was concerned with the extraction of fat from the waste food and refuse, whilst not depriving "Tommy" of all the fat he wanted in the form of food. By the method of boiling down and filtering, large quantities of fat were obtained, duly placed in tins and transferred to the Government department at the Base, which in turn sent it to England for utilization in the making of explosives for munitions. The Government paid the various units throughout France providing this commodity at the rate of about half a franc per lb. of pure fat; and it can be gathered how large a quantity was sent from a convalescent depot when it is estimated that depot funds benefited each month to the extent of about four thousand francs. This money was utilized entirely upon the men in providing them with luxuries in some shape or form whether it was extra food and drink at Christmas time, extra sporting material, or a contribution to the expenses of their entertainments, such as, outlay on a cinema plant, costumes for the concert party, scenery, stage properties, etc.

The dining-halls, as already has been stated, besides being utilized for their orthodox purpose, also served many others. Thus, they were used for lectures, dances, and in wet weather as parade grounds and places for physical and recreational training. And that they could fulfil all these purposes in a satisfactory manner certainly reflected great credit upon those responsible for these adaptations.

Pay Department.—An Army Regulation forbids the granting of pay to men on the sick list in general hospitals and convalescent depots. Whilst

it continued to apply to the former, a wise and tactful administration waived the application of the rule to convalescent depots, and granted the privilege to the patient of drawing a certain maximum, for the private ten francs a week, and on an ascending scale for N.C.O.'s and W.O.'s according to rank, that is to say, what was considered necessary to meet current expenses whilst not leading him into the temptation of spending his money in unprofitable enterprises, which, as a rule, were by no means difficult to find in his new environment.

Now, in order to pay out this weekly allowance to five thousand men, a well-organized system was an essential factor in the scheme of depot administration. The dining halls were utilized for the purpose and the actual process of payment was spread over several afternoons during the week so as not to interfere unduly with the many other important duties and activities of the men. An officer, usually the assistant adjutant and quartermaster, was placed in control of the department, and was assisted by a staff of permanent officials—comprising a staff-serjeant, a corporal and one or two clerks—and a variable number of temporarily employed patients. The necessary money was drawn from time to time from the local Army Pay Office on the authority of the Depot Imprest Account, and the staff in its daily routine of office work was obliged to keep accurate check of all paid out moneys by means of signatures and totals in the soldiers' pay books, and the so-called Army Acquittance Rolls. Since the sole responsibility rested upon the officer making the payments, and Army Regulations forbade the entrusting of government money to any rank but that of an officer, the possibility of fraud was thereby considerably reduced. Such money for payments and surplus cash was, of course, kept in the safe deposit provided for the purpose in the orderly room.

Shoemaking and Tailoring Departments.—These departments housed in Nissen huts, were under the control of permanent staff-serjeants who were duly qualified masters of their respective trades. They were assisted by a variable staff according to the stress of work on hand and culled from amongst the convalescent patients themselves under that system of employed labour already described. As a rule they were kept fully occupied with repairing footwear and clothing, whilst the master tailor did not hesitate to accept private work in his spare time from those who were either too indolent to undertake their own repairs, or else put little faith in their skill with the "housewife," without which no kit of the soldier, strictly speaking, could be said to be complete. Besides this, both shoemaker and tailor found their vocations highly profitable and their assistance most welcome in the provisioning of "properties" for the concert party.

Barber's Shop.—One of the first principles inculcated into the mind of the soldier was that he must endeavour to keep his hair short, and especially so round about the nape of the neck. Perhaps it might safely be said that the neglect of this order caused more trouble than any other between

"Tommy" and his C.O., or Regimental or Company serjt.-major. Strict disciplinary action was ever found necessary to urge the average soldier to conform to this regulation, and besides this every encouragement and facility were necessary. Hence in a convalescent depot a special barber's shop was provided and placed in charge of a permanent staff corporal. He was assisted by co-opted patients, who themselves had pretensions to the tonsorial craft. These, as can be imagined, were kept fully busy with the three to four hundred daily operations accruing from a total of five thousand men, each of whom found he required on an average a hair-cut at least about once every fortnight in order to enable him to retain his smart appearance and meet the wishes of his superior officers. Again, in their spare time, these barbers could engage in business on their own account and for private gain, since shaving, unlike hair-cutting, did not come within the category of free government provision though it was equally prompted by the rigorous upholders of neat and cleanly soldierly appearance.

Postal Department.—Letters and parcels were the only tangible method of communication between the soldier in France and his friends and kinsfolk at home. Hence one can readily understand how great was the task of the military postal department adequately to cope with the abundance of over-sea correspondence, an amount that increased rather than diminished as the war went on. Every convalescent depot added no mean quota to this vast bulk of mails. Here the soldier found more leisure for writing, greater opportunity on account of the encouragement and facilities, e.g., free paper and envelopes, writing desks, etc., afforded him by the various existing charitable institutions; moreover the desire to write was perhaps greater upon him since he had much to tell of the trials, troubles and dangers he had just come through, he was now enjoying comparative ease and immunity from danger, and, further, he could dilate at length upon his present occupations of work and pleasure. Therefore, not hundreds, but thousands of letters found their way daily into the pillar-boxes of the depot, and these had to be collected, censored and franked, and tied up in mail bags for dispatch to the local army post office. In the same way thousands of letters and parcels had in turn to be received, sorted and delivered to the men. The whole question demanded, therefore, a special department, with office, sorting rooms, and an adequate staff all under the control of an officer, and in addition a thoroughly organized scheme for the receipt and delivery of mails. The task of censoring, too great and monotonous a duty for one officer alone, was divided amongst the General Duty Officers, occasionally assisted by the voluntary services of one or more of the "padres."

There can be no question but that this work of the postal department, when ably carried out, proved a source of great happiness and comfort to all these, both at home and on active service, who were separated sometimes for such long intervals from those they loved.

Fire Brigade Department.—With such a large collection of wooden

huts and buildings the risk of fire was always a menace to be adequately met. To meet requirements a hand-pumping fire engine was kept in a centrally-placed shed in the depot, and a specially trained squad of men were kept to serve it. A system of water mains with accompanying hydrants and reservoirs was established throughout the depot grounds, and moreover, an ample supply of water buckets, constantly kept filled with water or sand, was ready at hand within easy reach of every building. Besides this squad of specially trained firemen the whole of the depot complement, including both patients and personnel, were periodically exercised in the practice of fire alarm. On the sounding of the alarm all available men in the depot were required to fall in on parade with buckets in hand in respective stations near their various hutments and company lines, and under W.O.'s and N.C.O.'s were doubled to the scene of the outbreak, and there were set about their task of extinguishing the fire in a well-ordered and efficient manner. The orderly officer of the day assumed control of the whole direction of fighting the fire, and in this duty he became thoroughly versed after oft-repeated practices. Thus the risks attendant upon the outbreak of fire were reduced to a minimum.

Police Department.—To assist in the maintenance of good order and discipline a guard-room and police force were essential. These were put in charge of a serjeant of police, whose duties, though not of a very enviable nature, were certainly most responsible, and who must needs possess the qualities of command over men, firmness and tact in an unusual degree. He and his men were responsible for the safe custody of prisoners awaiting trial or punishment on the charge of severe breaches of military discipline, acted as escort at the daily orderly room trials by the commanding officer, helped to control large gatherings of men, such as at concerts and other entertainments, guarded depot property in general, or prevented trespassing, and in addition acted as pickets at the various entrances, exits and boundaries of the camp area to prevent illicit leave-taking on the part of the men both by day and night. In addition, a picket was generally employed for duty in the town area during that period of leave between 5 and 9 o'clock in the evening granted to men on pass. Their duties consisted in patrolling the streets and helping the town military police corps to preserve the local administrative routine orders.

Quartermaster Stores Department.—Naturally the responsibility and work of this department should have fallen upon the shoulders of the adjutant and quartermaster, but in actual practice it was found advisable, owing to the large amount of work connected with the adjutant branch of this officer's duties, to give control of the quartermaster department to the assistant adjutant and quartermaster. In fact, the manifold duties connected with the adjutant and quartermaster departments resolved themselves into a division of labour, the senior officer performing those of the former department whilst the junior, his assistant, took over those of the latter. In this way more effective "administration" of both branches was found to be obtained.

The quartermaster's stores department might be likened to a general emporium on a small scale. It had its offices, store rooms, and receiving and dispatching platforms, and adjoining the main building were the food store, for meat, groceries and vegetables, and the coal and firewood enclosures. Centrally placed in the depot it was within easy reach of the dining-halls and their kitchens, and conveniently placed as regards means of transport either by light rail or road.

It would prove too tedious a task to enter into an enumeration of all the activities of this department as regards the provisioning of almost every commodity essential to the maintenance of the depot, whether it was the supply of food to the men, the refitting of them with clothing and equipment, the apportioning of coal rations, of cleaning materials and the supply of all those numerous articles and materials for the general maintenance and upkeep of the depot. Indeed, in its dealings directly with the Royal Army Service Corps, the Ordnance Supply Service, and the Royal Engineer Corps, and by means of its magic indent forms, it could furnish all kinds of articles from the humble bootlace for the "Tommy" to the elaborate electric light-stand for the officers' mess.

A clerical staff assisted in the work of keeping all necessary accounts and books, and every Government article in use in the depot, whether it were sock, shirt or vest; blanket, pillow or palliasse; plate, cup or basin; pick, rake or shovel, had each to be noted and duly accounted for. Stock-taking, usually about once every three months, was carried out systematically in order to check depot equipment and, whenever justifiable write off wastage owing to wear and tear. A process of decentralization lightened the task of distribution and lessened the burden or responsibility of the quartermaster. By this, divisions were made responsible for their own share of equipment, and since each division was supplied with a quartermaster-serjeant well versed and especially trained in this work, such responsibilities accepted by divisions were found to be not too difficult to bear, and at the same time were much appreciated by the central office.

General Maintenance Department.—Although the local administration provided a branch of the Royal Engineer Corps for the preservation of the depot buildings, the provision of new constructions on a large scale, the repair of the main roads, and the maintenance of water, electric, and sewage systems, it was nevertheless found necessary and more practicable to establish in the depot itself a department capable of effecting repairs of a minor nature, or that needed immediate attention, and of dealing with those hundred-and-one smaller details such as led towards improvement in the depot itself both as regards appearance as well as efficiency.

The carpenter's shop formed the basis or nucleus of this establishment and together with the sanitary department directed the control of those many and diverse activities associated with the proper upkeep of the depot. The whole department was placed under the control of a medical officer, assisted by a whole host of "employed" patients supplied by the Labour

Bureau. This officer, as can readily be imagined, was needed to possess business capacity, imagination, initiative and command in order to enable him to put ideas into effect, such as embraced practical schemes for ornamentation, sanitation, and all necessary repairs and improvements. Success on the part of this particular officer was borne out by such results as the following. The depot grounds were made to include large areas of vegetable gardens, which, when in full swing, provided fresh vegetables of every variety for the men, and were instrumental in saving the government, through underdrawing of rations in these commodities many thousands of francs besides means of transport, had this condition of things not prevailed. The general aspect of the depot was, moreover, beautified by means of flower beds and gardens, the planting of trees and shrubs, the bordering of paths with grass, and even the making of lawns, the keeping of rank grass cut short on the athletic fields, the erection of barriers and fences of rustic work or more sober structure, the painting of depot buildings without, the painting and ornamentation of offices within, the interior ornamentation of dining-halls, serjeants' and officers' messes, the clean appearance of cook-houses, latrines, incinerators and fat-extraction plant, sewage and drainage systems in general, accentuated the more so by the judicious application of black-lead for iron-work and white-wash in the neighbourhood of all these otherwise unsightly areas; the provision of painted notice boards and signs, the making of office tables, cupboards, racks, trays, and even, when the services of an expert cabinet-maker could be obtained, of articles of furniture for the messes such as would not have shamed the pretensions of many a London drawing room.

Thus, as one might gather, the question of a General Maintenance Department was one occupying a good deal of attention and energy if it were to bear results in keeping with the ambitions connected with the running of a well-ordered, highly efficient and attractive convalescent depot.

Orderly Room Department.—Lastly, one comes to that department, namely, the orderly room, which was the centre of control of administration over the whole depot, and was concerned with the task of correlating the activities of all the above-mentioned branches. This main administrative building was divided up into several rooms, comprising the commanding officer's office, the adjutant's office, or orderly room proper—an office for the administrative clerks, and another for the depot serjeant-major and his clerks and orderlies.

The work carried on in this department naturally embraced part of the commanding officer's duties, and the adjutant's in the matter of administration proper, such as touched upon outside relations, e.g., correspondence, the furnishing of records, the estimation of daily strength as derived from patient admissions and discharges, and that larger duty concerning the intimate knowledge and administration of the depot itself such as appertained to the discipline and welfare of the men, the supervision of

the work of divisions and the many depot departments just previously described, and the co-ordination of the whole into a definite, sound, and efficient policy. To attain to this high standard of efficiency, it needed great energy, determination, tact, and imagination on the part of that medical officer destined to find himself in command of such a large and important establishment. For success his policy must needs demand the following essentials, namely, the maintenance of a high standard of discipline, routine inspection of all convalescent patients and permanent staff personnel of the depot, constant supervision of all departments, the inspection of the whole area from the point of view of cleanliness, repair, improvement, and ornamentation; and finally the maintenance of a good moral tone amongst all the men, apart from the methods of discipline, by rigorous attention to their legitimate wants, such as were reflected in their appreciation of sufficient and palatable food, in the comfort of their living quarters, and in the full enjoyment, after the work of the day, of their sports, concerts, and other entertainments.

The adjutant, in the capacity of right-hand man to the commanding officer, assisted in all this, but more especially in the matter of discipline, with which he was intimately associated. Aided by the depot serjeant-major he directly controlled the work of all the special departments of the depot, e.g., the barber's, shoe-making, tailoring, police, fire brigade, etc., such as were not directly under the charge of another officer, and drew up standing orders, approved by the commanding officer, for their proper guidance and administration. Moreover, as has already been remarked, he had charge of the Depot Imprest Account, made weekly payments to the men, kept accounts of all depot funds accruing from the sale of fat extraction products, or gifts from charitable institutions; supervised the accounts of the Serjeants' Mess Fund, and, finally, controlled the Depot Lottery in the War Office scheme for the encouragement of the purchase of War Savings Certificates amongst soldiers on Active Service. In addition to all this his other activities included his presence on all parades of the commanding officer, his attendance on the latter during hours of inspection, his conduction of the daily procedure of orderly room parade during the commanding officer's trial of accused men, and, lastly, his attendance on Courts Martial either in the capacity of "soldier's friend" or prosecutor or, in the absence of the former, of both.

As regards the office organization of this department, namely, the work of the various clerks employed and their adaptation of an efficient scheme of indexing, filing and keeping of correspondence, records and other information—a scheme whereby, for instance, information could be obtained at a minute's notice regarding any man, admitted or discharged at any time during the life of the depot—it is unnecessary to dilate. Suffice it to say, that particular care had always to be exercised in this respect to ensure the smooth working of everything concerned. Moreover, in his task of co-ordination, and in his determination of policy, the commanding officer

depended not only upon the loyal co-operation and enthusiasm of his officers, with whom he held weekly conferences to discuss the welfare of the depot, but equally upon that spirit of good fellowship and sympathetic understanding that was wont to pervade all ranks throughout the British Army.

Conclusion.

What inference, then, can be drawn from the existence of these institutions throughout France during the progress of the Great War. The purpose of their origin has already been made manifest at the beginning of this work. It therefore remains only to confirm in this respect the beneficial results obtaining both to the convalescent soldier himself and no less to that ever-constant aim on the part of the military authorities—the maintenance of the highest possible strength of efficient fighting forces in the field. As regards the first factor, viz., the benefits accruing to the man himself, no doubt can remain in the mind of the reader after due consideration of all the influences—moral, spiritual and physical—actuating on his behalf, that he left the depot appreciably strengthened as regards his physical well-being and in his qualities of manhood, as manifested by his courage and determination to face once again his arduous, monotonous or dangerous services in the field such as he might be destined to undertake. Ideas of fatalism were rife in the mind of the average "Tommy," and it must be confessed that this spirit helped rather than hindered him in his acceptance of a task imposed upon him by his country in its determination to fight victoriously for the principles and ideals of humanity. Then as regards the question of reinforcement for the front area—especially in times of crises such as prevailed during the retreat of March, 1918, and when, as is well known, the fate of the whole of the British Army was imperilled, it is obvious that wastage could be more promptly accounted for than if these reinforcements had wholly to be supplied from England, and this too in the face of distance, the submarine menace, and difficulties of transport that prevailed. Indeed, in this particular instance of crisis in 1918 statistics proved that between the months of March and August convalescent depots in France, in returning no less than three hundred thousand men as reinforcements to the Front, played no small part in turning the tide of events and bringing about a check to the victoriously on-rushing enemy.

Thus we see that out of a small beginning there was evolved a system of convalescent depots throughout France such as reflected and creditably upheld the greatness of thought and genius of British organization and administration, and assisted, both from the humane and material points of view, the welfare and efficiency of our men as fighting forces in the field.

SOME NOTES ON THE TACTICAL HANDLING OF FIELD AMBULANCES IN MOBILE WARFARE.

By Major G. A. K. H. Reed.
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A mass of knowledge on this subject must be available in the Royal Army Medical Corps at the present time, but, so far, very little has been published on the matter. It is with the object of promoting discussion, and, if possible, gaining information from those who have probably had more experience than the writer, that these notes have been penned.

In order to save space, it has been necessary to be dogmatic at times, but it is hoped that the object of these notes, as set forth above, will absolve the writer from the implication that he is attempting to lay down the law on what is a very debatable subject.

The late War has been carried out in many different theatres where local and tactical conditions have varied enormously; what may be correct in France, with its comparatively deliberate movement and restricted divisional front, may be unworkable in Palestine or the Balkans, where frontages were often large and movements rapid.

The long intervals of trench warfare which have occurred have tended to minimize the importance of this subject, and very few attempts were made beforehand to work out the problem arising in mobile warfare from the point of view of the medical services with a division, or to obtain the co-operation of divisional and brigade commanders in their elucidation; consequently inter-communications broke down, and field ambulances were often left in the air.

The general offensives in 1918 found our knowledge in much the same position as it was in 1914, and brigade commanders still often looked upon a field ambulance almost in the light of a necessary evil, and were very loth to realize the responsibilities which necessarily devolved upon them when mobile warfare commenced.

Numerous pamphlets emanated from the War Office relative to modifications in the tactics of the other arms, but none appeared relative to the Royal Army Medical Corps.

There appear to be, broadly speaking, two schools of thought on the subject; one we may term the "divisional school," and the other the "brigade school." The divisional school hold that field ambulances must be at all times and under all conditions directly under the A.D.M.S.; the brigade school would place them entirely under the orders of the Infantry Brigadiers, at all events, when mobile warfare is being carried on. The supporters of the divisional school are generally found among the more senior officers of the Medical Service who have had long experience of administrative work, but who, perhaps, do not always realize the numerous

difficulties which beset the officer commanding field ambulance in the vital questions of inter-communication, and keeping in touch with units whose positions are constantly changing, and often cannot be foreseen. The advocates of the "brigade school" come principally from amongst field ambulance and section commanders, who, dissatisfied with the paucity of orders and information received from the A.D.M.S. during mobile operations do not realize the difficulties which he has to contend with, and who learn by personal, and often bitter experience, that the advanced post of the collecting zone is more easily worked when the unit is under the orders of a brigadier and forms part of his group. What happens in rear of their advanced dressing or main dressing station does not concern them.

Many officers are so emphatic in their opinions that they absolutely refuse to entertain the alternative idea under any circumstances; and this conservatism has often led to situations which might have been comic had the results not been so serious.

The legend of the A.D.M.S. who fought a different battle to the divisional commander has its origin in more than one theatre of war, and the instances of field ambulance commanders whose ideas have similarly deviated from those of the commander of troops on their front are probably more numerous.

Deficient and defective liaison was at the bottom of most of these incidents.

In the following notes an attempt is made to sketch out an organization which has been found to work well. The scheme is not new, or even original, but the paucity of official literature on the subject encourages the writer to proceed.

The whole matter is very debatable, and the working of an extemporized organization must be left very often to the initiative of officers concerned; but it is thought that some additions to Field Service Regulations are necessary in order to prepare both medical and combatant commanders for the modifications often necessary in the medical organization of a division during mobile warfare.

Field Service Regulations Part II states:—

(1) The field ambulances of a division will operate over the areas allotted to them according to arrangements made by the A.D.M.S.

(2) Their first duty is to establish touch by means of the Bearer Divisions with the Regimental Medical Services of the units in the area assigned to them, to observe the position of casualties and to obtain information regarding the places where wounded have been left.

(3) In order to meet developments the principle should be observed of not opening more sections than are absolutely necessary until the locality is known where the number of casualties is greatest.

(4) The work of removing wounded during actual fighting must be left to the initiative of officers commanding field ambulances.

(5) The A.D.M.S. is mainly concerned in issuing orders relative to the opening and closing of field ambulances, and in maintaining connexion between them and casualty clearing stations. He will indicate the place to which dressing stations (advanced?) will send back the wounded. One or more tent divisions of a field ambulance should be detailed to this spot.

The above general principles are perfectly sound, and are as true to-day as they were supposed to be before the War.

The next extract from Field Service Regulations Part II contains in a nutshell the crux of the whole question: "It is of great importance that information regarding the situation as affecting casualties and the area in which they are occurring should constantly be transmitted between brigade and divisional headquarters, in order to enable the A.D.M.S. to regulate the movements of field ambulances." In other words, instead of informing the neighbouring field ambulance of the incidence of casualties, the brigadier informs divisional headquarters which inform the A.D.M.S. who issues orders to the field ambulances. This is organization gone mad as applied to mobile warfare. By the time the A.D.M.S. has issued his instructions, the local field ambulance might have cleared the field. It is comparable to a brigadier who requires an urgent barrage and asks divisional headquarters for it, instead of applying to the artillery supporting him.

In practice these instructions are rarely, if ever, carried out.

The advocates of the "divisional school" point to the para. in Field Service Regulations, and read it to mean that all orders for movements of field ambulances must come through the A.D.M.S.—moreover, that ambulances must not move in default of these orders.

This is, of course, impracticable. In mobile warfare the wires are choked with urgent messages and reports on the constantly changing tactical situation; other matters are necessarily shelved.

What happens in practice is, that as soon as the special idea and operation orders come to him, the A.D.M.S. gets out a general plan and fixes the positions of main dressing stations and the initial positions of advanced dressing stations. After that, as he cannot hope to keep in touch with the immediate progress of events on the whole divisional front, he must leave the further movements of field ambulances to those who can keep in touch with the situation on a limited front—in other words, the brigadier and officer commanding field ambulance. Any subsequent orders he may issue on information received through divisional headquarters are more often than not obsolete by the time they reach medical units. In mobile warfare information comes most frequently from front to rear, and the constantly changing situation must be dealt with on the spot and at once; delay would be fatal.

This principle applies as much to the Royal Army Medical Corps as to other units of the division. I do not refer, of course, to orders relative to change of plan on the part of the Divisional Commander, but even these are in practice received more quickly through brigades than from the A.D.M.S. with divisional headquarters.

The field ambulance commander must depend on brigade, or even battalion headquarters, for his information if it is to be of any use to him; so that he should be in close touch with and under the orders of the brigadier, and the latter should be accustomed and ready to give him all the assistance and information he requires.

A para. in the Field Service Regulations pointing out the necessity of this would help matters, and it is suggested that a few remarks on field ambulances in Part I of the Field Service Regulations are necessary, as the question is one of Operations, and not of Administration. How often has the field ambulance commander, on visiting brigade headquarters, in order to get information unobtainable elsewhere, been met with the remark: "Why don't you ask the A.D.M.S., you are under him"?

The opponents of the brigade organization, as affecting field ambulances, give as one of their reasons against it that brigadiers will begin to look upon a field ambulance as part of their command, and that friction may be caused thereby. I have personally never found brigadiers make any claim of this sort if the position is clearly explained to them, i.e., that the arrangement is a temporary one to meet the peculiar condition of mobile warfare.

The organization of a division is often drastically changed in mobile warfare as regards other branches of the service. The Divisional Artillery normally under the Brigadier General Royal Artillery is split up into its component brigades and attached pro tem. to brigade groups under brigadiers; even batteries may be detached to work with battalions, and the Brigadier General Royal Artillery manifestly cannot command them under these circumstances, and does not attempt to do so; if the gunners acquiesce in the necessity of this, there must be an excellent reason for it which will apply equally to the field ambulances, the bearer portions of which must be in very close co-operation with the Infantry brigades.

In order, however, to carry out the excellent principles of Field Service Regulations, Part II, the A.D.M.S., must have something up his sleeve to meet contingencies. He must also have the main dressing station or stations under his own complete control in order to arrange for evacuation and to keep touch with the motor ambulance convoy. He is generally out of immediate touch with the field ambulances with brigades: his attempts to connect with them through the signal service will be often useless; his messages must wait, if mobile operations are in progress, and he must depend on motor cyclists from the field ambulances for intercommunication if he can get them, and their machines have not been commandeered for other purposes.

How can these opposing principles be reconciled? I submit like many others by a judicious compromise.

Let me emphasize that I am not in any way in favour of altering the existing organization of field ambulances, the present one is, in my humble opinion, elastic and satisfactory and has met the varying requirements of

the War, nor do I suggest relegating the A.D.M.S. to an entirely administrative position. He must command the field ambulances of a division in the same way as the Brigadier General Royal Artillery commands the Artillery, but like the latter, he should be prepared to meet a situation and not adhere to central control at all costs as some have endeavoured to do.

The alteration in organization sketched below is only meant as an expedient to meet a certain situation, and I think that most officers will agree that something of the nature is needed to meet the exigencies of mobile warfare.

I suggest that as soon as mobile operations are on the "tapis," the A.D.M.S. should form a combined divisional unit made by withdrawing two tent subdivisions, Sections B and C, and half a bearer subdivision from each field ambulance with the necessary transport. This improvised unit would be under the command of the senior Section Commander in the division and be under the direct control of the A.D.M.S. In the line of march it would march with the headquarters of divisional train. It would include the majority of the motor ambulances.

The field ambulance (less half subdivision of bearers and two tent subdivisions) would march with its brigade under the brigadier's command and be considered (temporarily) as part of his group. This truncated field ambulance forms a very handy unit in mobile warfare, it contains five-sixths of the bearer personnel of the field ambulance and tent personnel sufficient to form an advanced dressing station and sundry collecting posts. Its function would be to collect and evacuate its cases as speedily as possible and to keep complete touch with the brigade under all circumstances. The horsed ambulances and two or three motor ambulances would form part of this unit.

The functions of the divisional unit would be to form main dressing stations and to take over the wounded from the advanced dressing stations of the field ambulance and treat them until they can be evacuated by motor ambulance convoy or supply lorries to rail-head or the casualty clearing station. It would be often necessary during a rapid advance to take over advanced dressing stations from the field ambulances "holus bolus" probably exchanging transport and equipment to save time or to form several dressing stations in echelon, as at all costs the field ambulances must be kept free and mobile.

In the 1918 offensive some A.Ds.M.S. used a complete field ambulance as a second line unit for this purpose, and this, while giving the advantage of working with a complete unit under its own commanding officer, had one great disadvantage in that the officer commanding one of the advanced field ambulances had to keep touch with at least two brigade headquarters and a corresponding number of regimental medical officers. I believe this system was workable in France where the division occupied a narrow front and the rate of advance was comparatively slow, but in other theatres where advances were more rapid and frontage wider, it led to great diffi-

culties and delay in clearing the field; one cannot help thinking that, "one brigade one field ambulance" (or part thereof) is the only satisfactory organization when mobile operations are taking place, as brigade headquarters are often miles apart and heading for widely diverging objectives.

The territorial system of affiliating field ambulances to certain brigades has many advantages, it promotes liaison and a sense of mutual responsibility among units and smooths over many difficulties.

It is suggested that as soon as the A.D.M.S. receives orders which will result in a prolonged advance he should form the divisional unit, described above, part of this unit (two tent subdivisions with half a bearer subdivision) will be detailed to form the first main dressing station, the remainder to stand by in the vicinity ready to move.

Motor ambulances (less two to three with each field ambulance) will be similarly withdrawn and parked by the main dressing station. He will fix the initial position of advanced dressing stations one for each brigade in the line; if a brigade is in reserve its field ambulance will not open but stand by, ready to move.

A field ambulance (less eighteen bearers and B and C tent subdivision) will be detailed to each brigade, if not already affiliated, and be placed under the orders of the brigadier (for tactical purposes only) it will draw its rations from brigade supply and be part of the group.

When actual movement ceases, it will come under the A.D.M.S. directly once more.

As the whole question of collecting wounded is one of liaison, the following arrangements for inter-communication are suggested:

Field ambulance commanders will at once detail three reliable runners to each regimental medical officer, and two, including one N.C.O. to brigade headquarters. These runners should have the general scheme of the operations explained to them as far as it affects their duties. It was sometimes found necessary to attach one or two stretcher-squads to each regimental medical officer in order to help with the collection and grouping of casualties.

The runners attached to regimental medical officers are to keep touch between regimental aid post and brigade headquarters or advanced dressing station of the field ambulance and between new and old regimental aid posts, they will act as guides to stretcher parties and convey messages as to position of groups of wounded and situation as regards casualties in general; the runners at brigade headquarters are to keep touch with advanced dressing station. The brigadier will by means of them, keep the officer commanding field ambulance posted in all movements actual or contemplated, and will send him copies of all orders. The position and moves of advanced dressing station will be notified in brigade operation orders, positions of regimental aid posts will be notified to brigade by battalion commanders, officers commanding field ambulances will inform A.D.M.S. at once of any change in position of their advanced dressing station, and

whenever necessary, and at least once in every twenty-four hours, of the general situation as regards casualties. A.D.M.S. will notify officers commanding field ambulances by the quickest means, of changes in position of main dressing stations ; he should arrange all evacuations from advanced dressing station, and when necessary take over advanced dressing stations from officers commanding field ambulances as they stand, equipment and transport being exchanged to save time. In order to facilitate the latter an absolutely uniform method of packing wagons should be insisted upon throughout the three field ambulances.

The motor ambulances previously withdrawn from field ambulances will be used as a convoy and be under his personal control or that of his deputy.

If the advance continues at a rapid rate advanced dressing stations in succession may have to be taken over and the divisional unit may then consist of a series of dressing stations or posts scattered along the principal roads. These stations will be cleared as soon as possible by the divisional motor ambulances or by corps arrangements with the motor ambulance convoy or by returning supply lorries (for slight cases). The scattered components of the divisional unit rejoining their divisional headquarters as soon as possible.

The question of making a single permanent divisional unit of this nature (in addition to the three more or less modified field ambulance units) and providing it with motor transport has, I believe, been considered, and the suggestion would appear to offer many advantages over the present organization at all events in mobile warfare.

As regards the tactical handling of field ambulance stretcher-bearers, much more is required of them in mobile warfare than the mere clearing of regimental aid posts. The experiences of 1914 in France during the retreat of Mons and subsequent advance of the Marne, were almost forgotten in the long period of trench warfare which followed.

In open highly mobile warfare, such as occurred in Palestine and the Balkans, it was necessary in many cases to systematically search for wounded on the ground over which the troops were advancing and not merely to wait for reports from regimental medical officers; in this way very many wounded who had been lost by their units were picked up. In order to carry out the systematic searching, special training is necessary in extended order drill on the lines laid down in Infantry training. A scheme of training for this purpose appeared in the Journal of May, 1914, and was found satisfactory by those who used it.

The transport with the field ambulances attached to brigades would be that of "A" section, plus the limbered G.S. wagon of section B. or C. and would include all the horse ambulances and a proportion of motors.

A large proportion of ordnance stores could be dumped and the room thus made utilized. for the extra stretchers, blankets, medical comforts and supplies. The remainder of the transport would be with the "Divisional Unit." As regards the latter, if the operations are likely to be highly mobile

and so take the division out of touch with the advanced depots of medical stores and other sources of supply as was the case in Palestine, two additional G.S. wagons or their equivalent per field ambulance (to be attached to the divisional unit) would be required for the carriage of a reserve of stretchers, blankets, comforts and medical supplies.

Sixty camel loads (eight tons) of these, were carried by the 54th Division during the advance in Palestine in 1918, and were found absolutely essential.

It is submitted that if some such scheme as outlined above was referred to in the official hand-books, coupled with a paragraph on the necessity of embodying medical arrangements in divisional, brigade and battalion operation orders, it would save the A.D.M.S. a great deal of "rush" work in extemporizing a more elastic organization than the official one, at the last moment, would prepare brigade and unit commanders for the necessity of co-operating in the modifications of organization necessary in field medical units during mobile operations, and would certainly facilitate the work of field ambulance commanders in giving them a text on which to base their liaison with brigadiers and unit commanders.

In conclusion, I have to express my thanks to several officers of the corps who have talked over the subject with me and whose views are wholely or partly embodied in the above notes.

THE MEDICAL ASPECT OF TANKS.

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Medical Tanks.

The revolution produced in modern warfare by the successful introduction of tanks naturally compels attention to the extent of their usefulness in other branches of the Service. The question immediately arises, why not have medical tanks? From the medical point of view, the scheme is an alluring one, and the Mark V*[1] and Mark IX offer particular attraction in this direction. These tanks are really infantry carrying tanks, with a cubic capacity of roughly 690 cubic feet, and there is no reason why they could not be mechanically designed for medical purposes.

The tank would correspond to the sick bay of a battleship. Stretchers and hammocks could be adjusted in tiers, capable of holding half a dozen lying cases, or twenty sitting cases. The doors would have to be enlarged in the mark V* for the entrance and exit of stretchers.

A dressing-table could be arranged in the centre of the tank behind the engine, and electric light is provided. There is practically no limit to the amount of stores which could be carried, and if necessary, sledges towed by the tank could be used for this purpose.

During the battle the tank would manœuvre in liaison with the field ambulances, and in fact would constitute a movable and protected advanced dressing station. In addition, it could evacuate cases at night time, direct to a spot where they could be transferred to motor ambulances. It is thus seen what an extraordinary saving would take place in the tedious work of the stretcher-bearers. Should the necessity arise of a tank brigade

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[1] When the Armistice was declared a Mark V* Tank had been fitted to carry six stretchers, and arrangements had been made to give it a trial early in the following year.

operating alone in open warfare, the need of a medical tank at once becomes imperative.

Up to the present time tanks rallying from action have rendered great service in bringing back the wounded. In one instance, during the Battle of Cambrai, one tank brought back as many as sixteen wounded.

During the operation of the Australian Corps at Hamel, it is estimated that as many as 150 wounded were brought in by tanks.

Tank Satchels.

At present each tank possesses as its medical equipment one tank satchel, which is a specially arranged First-aid Bag. The contents are as follows:—

Bags Canvas Waterproof	No. 1
Shell Dressings	,, 7
Picric Acid 1 per cent. in Boxwood Cases..	8 oz.
Sal Volatile, in Boxwood Cases	8 ,,
Gauze Compressed, and Plain	$2\frac{1}{2}$ yd. of each
Bandages Compressed	No. 6
Ammonia Capsules	,, 52
Earthenware Measure	,, 1
Gooch Splinting 1 ft. square	,, 1

Tank Complaints.

Minor accidents stand out prominently in the daily sick parades throughout the corps, which is accounted for by the mechanical nature of their work.

An exanthematous dermatitis resembling impetigo affecting the exposed surfaces of the skin has been noticed and is attributed to the irritating effects of petrol fumes inside the tank, especially when inferior brands of petrol and oil have been used for training purposes. These fumes are sometimes oppressive and give rise to a tight feeling in the chest, and a burning sensation on the mucous membrane of the nose and throat, and smarting of the eyes.

Nature of Wounds received in Tanks.

As a rule the casualties have been light. The wounds are either severe or very slight. Severe wounds are usually the result of a direct hit or when crews are wounded in the ordinary way outside the tank. There have been instances of only slight wounds resulting from the explosion of a shell inside the tank. The vast majority are only splash wounds, due either to splinters from the inner table of the armour plating, as the result of the impact of armour piercing bullets, or splinters from ordinary bullets entering between the chinks of the armour plate fittings. As a rule these cases remain at duty. Splinters in the eye have been troublesome, and a veil made of fine steel wire has been devised for covering the face, but as a rule it is too cumbersome to be worn with comfort.

As the result of land mines and shells of large calibre exploding near

a tank, some of the crew have been concussed, others have complained of pain and swelling of the ankle and knee-joints, and bruising of the os-calcis has been found. In one case the explosion of a land mine was sufficient to rupture the boot laces and puttees of one of the men. Burns are very common, generally the result of a direct hit into the petrol tank.

In some cases there has been spontaneous combustion of the tank, and the theory is advanced that it is due to red hot sparks, the blow back of a 6-pounder gun, or a red-hot exhaust pipe igniting the air inside the tank, which has become saturated with a combustible mixture of petrol vapour.

Symptoms Inside Tanks.

From the early days, it was noticed that after prolonged work inside tanks, men complained of headache and faintness. In February, 1917, crews were detailed to run their engines periodically at night to prevent freezing. In one instance this was done with the tarpaulin cover over the tank which prevented the escape of exhaust gases. The crew slept in the tank, and in the morning on coming out into the fresh air complained of headache, faintness, giddiness, and sickness, they all collapsed, two vomited, and one was slightly cyanosed, and all had weak rapid pulses. Similar symptoms were reported later, after tanks (Mark IV) had been in action.

Since the advent of the Mark V and V* these symptoms have been intensified. Information collected from all sources has established the presence of the following symptoms: Headache, giddiness, breathlessness, palpitation, vomiting, mental confusion, unconsciousness, collapse, convulsions, red complexion, rise of body temperature.

Headache comes on early; it is severe in many cases, and sometimes lasts as long as forty-eight hours. It is always present. Singing noises in the ears are usually present.

Giddiness, like headache, is always present, and is accentuated on getting out into the fresh air.

Breathlessness is prevalent, and is aggravated by wearing the box respirator and by the fumes inside the tank.

Palpitation occurs to the same extent as breathlessness. The pulse is rapid and weak. As a rule the tachycardia is only transitory.

Vomiting and nausea are prominent symptoms, and their frequency, apart from the presence of CO, and high temperature may be explained on the analogy of sea-sickness. At any rate, it is seen more in people who are not used to tanks, viz., infantrymen.

Mental Confusion is an interesting symptom. The men sit and stare in front of them and merely repeat orders without putting them into execution. The mental plane is decidedly lowered, there is drowsiness and an irresistible desire to rest or sleep. Two cases have occurred of defiance of discipline where superior officers have been attacked. In another case a

man ran about shouting and cursing in an aimless manner. One case of temporary mania is reported from a Whippet Battalion.

Unconsciousness is relatively frequent. In one tank during a long approach march the driver became totally unconscious, and was found holding his controls in a convulsive grip. He was succeeded by the second driver, who after a time shared the same fate. Finally the tank commander took over until he too had to be dragged from his post unconscious.

Collapse and mental confusion occur more or less in the same proportion. Men have fainted in the tanks, but more frequently on getting out into the fresh air.

Convulsions are infrequent, and have only been reported from one source.

The red complexion associated with carbon monoxide poisoning has been reported by officers in Whippets and Mark V* Battalions. This is, however, rare, and the cases usually present a pallid or ashen grey appearance.

A Whippet Brigade reported that one of the chief symptoms was loss of power in the limbs, "making it impossible to walk or run quickly, and taking at one time two men to load a gun."

On an average it has taken three hours running in a closed tank for the symptoms to develop—in a few cases in a quarter of an hour, in others not until six hours.

In seventy-five per cent of the reports it is stated that fumes from the firing of the Hotchkiss and 6-pounders have aggravated these symptoms. Temperatures taken of men who have been inside tanks for some considerable time show that the body heat is raised anything up to 102° F. The pulse-rate is usually quickened.

One man after a three hours' run, in which the tank had developed 30° C. wet bulb, had a temperature of 101·4° F. and pulse of 168. After twenty minutes' rest the temperature was 99·4° and pulse 144. Three men from another crew after three hours' run had: Temperature 100° F.; pulse 110. Temperature 99·4° F.; pulse 112. Temperature 99° F.; pulse 112.

Taking reports in general from different sources the percentage of the symptoms noticed was roughly as follows:—

Headache	100 per cent.
Giddiness	100 ,,
Breathlessness	62·5 ,,
Palpitation	62·5 ,,
Vomiting	67·5 ,,
Mental confusion	50 ,,
Unconsciousness	60 ,,
Collapse..	48 ,,
Convulsions	12 ,,
Red complexion	12 ,,

As a rule the symptoms soon pass off, but as a result the crews are extremely exhausted.

The men are not fit for duty for a period varying from two to seven days, so that in a continuous action it becomes a serious problem as regards finding fit men to man the tanks.

VENTILATION OF TANKS.

The question of ventilation has attracted a great deal of attention as a result of the actions fought with the Mark V, V*, and Whippets.

The designs of the Mark V and V* have been altered considerably from that of the Mark I and IV, in which the radiator was situated across the after end, and beside this was a fan which drew air from inside the tank through the radiator and expelled it through louvres let into the armour plating behind, near the end of the exhaust pipe. This ensured tolerably good ventilation and helped to disperse the exhaust gases outside. However, the air drawn through the radiator was warmed after running; this gave rise to the mechanical defect of causing the water in the radiator to boil. To obviate this in the Mark V and the V* the radiator was placed outside on the right-hand side at the after-end of the tank. A fan was fitted to it, and drew in air through louvres on the left-hand side, blew it through the radiator and expelled it through louvres on the right-hand side.

In transit some of this air can be admitted into the tank through a slide-door let into the radiator casing.

For cooling the radiator this is efficient, but for ventilation it is most unsatisfactory in that the side of entry of the air being situated near the end of the exhaust pipe, it is possible with a following breeze for exhaust gases to be sucked into the tank.

In addition to this, further ventilation is provided for by means of a fan situated behind the point of exit of the exhaust-pipe, which sucks air from within the casing around the exhaust-pipe and the engine casing itself, and expels it through a cowl on the roof.

This serves to cool the exhaust-pipe, which, after running, tends to become red hot, and may cause starting of the exhaust joints. It is to these joints that particular care should be given, as in the experiments cited below; it has been here that the more definite traces of carbon monoxide have been found.

Ventilation in this type of tank fails because there is no continuous current of air drawn over a large surface flowing into the tank, and as a consequence pockets of carbon monoxide are likely to form.

In the Whippet ventilation is provided for on similar lines. In the fore compartment, which contains the engine, two fans suck in air from beneath the tank and expel it via the radiator through louvres on both sides.

This compartment communicates with the body of the tank, at the back of which are two fans sucking air into it. Here again the escape of

exhaust gases is so directed as to make it possible for them to gain admission into the tanks.

Tank Exhaustion.

Carbon monoxide was suspected as a cause of the exhaustion of tank crews; its action would be intensified in the presence of other gases such as excess of carbon dioxide, and where there is diminished oxygen.

Furthermore, the cumulative absorption of carbon monoxide would be facilitated by the fact that the crews are exposed to much muscular exertion, anxiety, and mental excitement.

Experiments.

The following experiments were conducted :—

Tanks were run closed down to represent battle conditions, and samples of air were taken from different positions and tested by the hæmoglobin method for carbon monoxide. Readings from the wet and dry bulb temperatures were registered and individual temperatures were taken.

September 7, 1918. Mark V Tanks. Observations made during three-quarters hour run.

Time		Temperature	
		Dry bulb	Wet bulb
2.30 p.m.	Start	70° F. = 21·1° C.	64° F. = 17·7° C.
2.40 ,,	..	75° F. = 23·8° C.	66° F. = 18·8° C.
2.57 ,,	..	81° F. = 25·6° C.	68° F. = 20·0° C.
3.0 ,,	..	83° F. = 28·3° C.	70° F. = 21·1° C.
3.12 ,,	..	86° F. = 30·0° C.	72° F. = 22·5° C.
3.20 ,,	Stop	90° F. = 32·2° C.	74° F. = 23·3° C.

Samples of Air Taken.

(1) Level of induction side of engine.
(2) Level of exhaust side of engine.
(3) Driver's seat.
(4) Centre of tank behind engine.
(5) After end of tank.
(6) Above engine within casing.

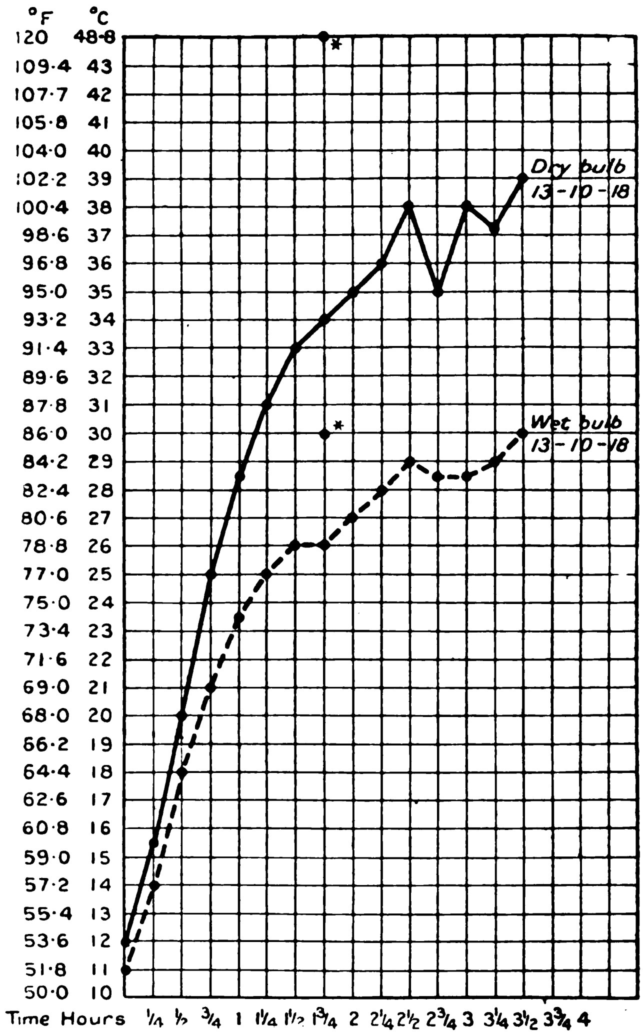
No appreciable amount of CO was found. On this occasion a strong wind was blowing and the tank could not be satisfactorily closed up so that ventilation was tolerably good.

September 13, 1918. Mark V*. After running one and a half hour. Samples taken from :—

(1) Inside engine casing.
(2) Driver's seat.
(3) After end of tank.
(4) Middle of tank.
(5) Exhaust pipe outside.

Sample 1 showed a definite trace of CO; samples 2, 3 and 4 showed less; sample 5 showed abundant CO.

"L" had pulse rate 96, and temperature 99° F.
"B" had pulse rate 88, and temperature 98·6° F.
No wet and dry thermometers were available.



Normal Mark V Chart. Autumn Day.
* Temperature at end of 1¾ hours run in a Mark V*

September 16, 1918. Mark V and V* were used, after running one and three quarter hour.

		Temperature :	Dry bulb		Wet bulb
Mark V	..	..	109° F. = 42·7° C.	..	79° F. = 22·2° C.
Mark V*	Start	..	118° F. = 47·7° C.	..	85° F. = 29·4° C.
	Finish	..	120° F. = 48·8° C.	..	86° F. = 30·0° C.

Samples Mark V.

(1) Centre of tank.
(2) Level with exhaust side of engine. (Casing closed.)
(3) Level with induction side of engine. (Casing open.)

Sample 2 showed a distinct though small amount of CO; sample 1 a trace; sample 3 practically nil.

Samples from Tank V.*

(1) Centre of tank.
(2) Level with induction side of engine. (Casing open.)
(3) Driver's seat.
(4) High up in Conning Tower.
(5) Level with exhaust side of engine. (Casing closed.)
(6) Above engine on exhaust side.

Each sample contained a distinct though small amount of CO, the greatest in six, and the least in three. In this case "B" who remained still, had a temperature of 98·8° F. "D" and the driver respectively, 100·5° F. and 100·4° F.

October 14, 1918. Mark V after running two hours. The following samples were taken with a view to calculating the amount of carbon monoxide present.

Outside Tank.

(1) Six feet from back of the tank, four feet above ground.
(2) Six feet from back of the tank, six feet above ground.
(3) Twelve feet from back of tank, four feet above ground.
(4) Twelve feet from back of tank, six feet above ground.
(5) Opposite intake louvres to radiator fan with a following wind.

Inside Tank.

(6) Behind engine.
(7) Behind engine.
(8) At driver's seat.
(9) At driver's seat.

Sample No.	CO_2 per cent	CO per cent	Wet bulb O.C.	Dry bulb I.C.
1	0·18	Nil	—	—
2	0·15	0·16	—	—
3	0·12	Nil	—	
4	0·14	Nil	—	
5	0·17	0·11	—	—
6	0·09	Nil	19·8	30·0
7	0·16	0·16	20·3	31·8
8	0·10	0·09	—	—
9	0·15	0·12	24·5	37·0

The figures given for CO are possibly high, as there may have been some unconsumed hydro-carbon present which would slightly affect the results.

The carbon dioxide CO_2 percentage is low and as such would have no effect, but would have been greater had a full crew been in the tank.

Suggestions for Preventing Tank Exhaustion.

The main considerations are to allow as much fresh air into the tank as possible, and to prevent overheating. Crews should be medically examined regularly, and if possible, should be rested before going into action. After action a minimum rest of forty-eight hours should be given to crews. In cases of severe poisoning by carbon monoxide, recourse should be had to prolonged artificial respiration, and administration of oxygen. Cordite should be used in preference to other explosives such as N.C.T. (nitro cellulose tabular) and the fitting of parabolic cups to the machine guns would help considerably, in disposing of explosion gases, which contain carbon monoxide.

Before Action.

(1) Test all exhaust pipes connexion, inside the tanks, and see that the asbestos packing is efficient, and that the engine casing is closed.

(2) Ensure fans are working satisfactorily. The fan ball bearings are apt to give trouble when overheated.

(3) Mop up all waste petrol and oil inside the tank, and prevent oil splashing on red hot surfaces.

Approach Marches.

(1) Keep all means of ventilation open as long as possible.

(2) A distance of twenty-five yards should be kept between tanks proceeding in echelon.

(3) Avoid exhaust gases from neighbouring tanks, by studying the direction of the wind. With a following wind always close slide door to radiator at the after end of Mark V and Mark V*.

(4) Driving should be done in relays of half an hour at a time, and a constant watch kept on each other by members of the crew.

Conclusion.

In conclusion it is clear that tanks with a full crew on board, and closed down for action after running a certain time, are liable to show both the presence of carbon monoxide, and a high wet bulb temperature.

The extent of these will depend upon the mechanical efficiency of the tanks.

It is therefore strongly urged that the subject of ventilation should receive far more consideration in future than it has in the past. Good and efficient ventilation will obviate both these defects.

I am indebted to Lieutenant-Colonel C. G. Douglas, C.M.G., M.C., R.A.M.C., physiological Advisor to the Director of Gas Services, and to the late Lieutenant-Colonel W. Watson, C.M.G., Director of the Central Laboratory for their kindness in giving the benefit of their valuable advice, and for carrying out these experiments.

Clinical and other Notes.

SIXTEEN CASES OF INFECTION WITH *BACILLUS AERTRYCKE*. CLINICAL AND LABORATORY OBSERVATIONS. A NOTE ON THE RELATIONSHIP OF *B. AERTRYCKE* AND *B. PARATYPHOSUS* B.

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Cases of this infection have been comparatively rare during the late war.

The outbreak differed little in its nature, save perhaps in the moderation of the clinical signs and symptoms in all cases, from what is generally observed when a group of people have taken material in which *Bacillus aertrycke* has been living and its toxines have developed therein or have become infected by taking in the bacillus without added toxic material.

The sixteen cases to be described were all V.A.D. nurses coming out from England and transhipping in the eastern Mediterranean for Malta. They had not been ashore for about fourteen days prior to onset of their illness.

Cognizant of the rôle played by food and carriers in this disease, searching inquiry to determine any common factor was undertaken by Colonel J. R. Robertson, I. M.S., Special Sanitary Officer, and by Colonel G. B. Price, A.M.S., who commanded the hospital in which the cases were treated. Up to the time of the ship leaving Malta no conclusive epidemiological finding could be made, and before the arrival of the hospital ship at the next port of call it was sunk.

The number of cases formed but a third of the total of nurses travelling under the same conditions on the ship, and being nurses, they were able to assist greatly in the investigation. No special relationship to sleeping places, seats at one table, attendance by one servant or use of one bathroom, could be traced. With regard to food it was really remarkable how impossible it was to determine a dish or drink taken by all during a few days prior to their illness.

A chart showing the clinical conditions on admission and progress under treatment has been prepared in collaboration with Dr. Gertrude Dobrashian under whose immediate care the patients were; and laboratory findings of direct interest to clinical workers are included. It may be emphasized that the disease was in all but one case of mild form, of concurrent incidence and short duration and was characteristic in presenting the form of a gastro-enteritis rather than of a septicæmic infection. Evidence showed proliferation of the bacillus in the intestinal canal and its early disappearance after the cessation of symptoms. Blood sowings made on the second or third day after onset remained sterile. All patients had received T.A.B. vaccine a month or two before.

Animal Experiments.—Cultures made from the *B. aertrycke* isolated from two of the patients gave similar results. Full grown guinea-pigs were used.

Peritoneal injection of $\frac{1}{20}$ of a twenty-four hours' growth on an agar slope from a test tube of seventeen centimetres by seventeen millimetres. Death

SUMMARY OF CLINICAL OBSERVATIONS.

Date of onset of symptoms	Initial symptoms	Physical examination, etc., on admission	Character of temperature	Date when temperature first normal	Further progress	Character of stools with microscopic examinations. The consistency of the stool was most frequently attributable to the line of treatment	Result of stool culture for *B. aertrycke*	Blood cultures
6.10.16 a.m.	Shivering, headache.	Oct. 7, tongue very furred, spleen just felt.	Oct. 8, a.m., normal		Oct. 13, headache, constipated	9.10.16 Liquid. Rare mucus flakes, white blood cells, rarer epithelial cells	— 9.10.16	Ten c.c. were taken from cases in hospital with raised temperatures. No growth resulted.
		Temperature 100·2°, pulse 88	p.m., 99·2°	Oct. 9 ..	Thereafter uninterrupted recovery	20.10.16 and later, normal ..	— 20.10.16	
6.10.16 a.m.	Colicky pains, shooting pain down left leg, headache. Shivering later in day	Oct. 7, rigor on admission. Temperature 103°. Headache over vertex, abdomen slightly distended, tongue very furred	Fell by lysis	Oct. 10 ..	Tongue remained very furred until Oct. 15. No appetite until that date	8.10.16 Liquid. Rare mucus flakes, white blood cells, rarer epithelial cells	+ 8.10.16	
					Thereafter uninterrupted recovery	18.10.16 and later, normal ..	— 18.10.16	
6.10.16 p.m.	Shivering, headache. Aching all over	Temperature 103°, pulse 112. Tongue very furred. Nothing else abnormal	Sharp fall ..	Oct. 9, evening	Tongue remained coated until Oct. 12; did not seem well until this date. Debilitated	10.10.16 Liquid. Mucus flakes, white blood cells, rarer epithelial cells	— 10.10.16	
						20.10.16 and later, normal ..	— 20.10.16	
6.10.16 a.m.	Headache, backache, slight diarrhœa, nausea	Temperature 100·8°, pulse 90. Tongue slightly furred, abdomen tender all over	Oct. 8, a.m., normal p.m., 99·2°	Oct. 9 ..	Oct. 12, appeared quite fit again. Not constipated. Oct. 18, facial neuralgia	10.10.16 Soft. Mucus flakes, white blood cells, rarer epithelial cells	— 10.10.16	
					Thereafter uninterrupted recovery	18.10.16 and later, normal ..	— 18.10.16	
6.10.16	Headache, backache, slight diarrhœa and pain	Temperature 100·6°, pulse 92. Eyes suffused, tongue furred	Gradual fall	Oct. 10, a.m.	Oct. 12, clinically quite well again	9.10.16 Nil. Abnormal ..	— 9.10.16	
6.10.16 p.m.	Shivering, headache, aching all over, epigastric pain	Temperature 102°, pulse 96. Perspiring, slight epigastric tenderness, tongue furred	Fell by lysis	Oct. 10, a.m.	Very constipated, bowels acted only after strong purgative or saline given	9.10.16 Liquid. No mucus, white blood cells, rarer epithelial cells	+ 9.10.16	
						18.10.16 and later, normal ..	+ 18.10.16	

5.10.16	Oct. 4, out of sorts. Oct. 5 (p.m.), abdominal pain. Oct. 6, headache, vomiting, bowels loose	Temperature 100·2°, pulse 100. Slight epigastric tenderness. Gurgling, iliac fossa. Tongue slightly furred	Sharp fall ..	Oct. 8 ..	Oct. 20, bilious attack, headache, vomiting Thereafter uninterrupted recovery	9.10.16 Liquid. Much glairy mucus, white blood cells, rarer epithelial cells. Many Gram-neg. curved bacilli which did not grow on aerobic cultures 18.10.16 Soft. With little mucus, white blood cells, few epithelial cells. Later normal	+ 9.10.16 — 18.10.16
6.10.16 a.m.	"Tired," with headache towards evening, bowels loose, vomited once Shivered at night	Temperature 100°, pulse 108. Face flushed, slight epigastric tenderness, tongue very furred	Remained at 100° till Oct. 9, a.m.	Oct. 10 ..	Continued to have colicky pains and to pass mucus till Oct. 15. Thereafter uninterrupted recovery	9.10.16 Soft. Fragments of mucus, rarer white blood cells and epithelial cells 18.10.16 Normal	— 9.10.16 — 18.10.16
6.10.16 a.m.	a.m.: Nausea, drowsiness. p.m.: Vomiting, diarrhœa, abdominal pain	Temperature 100·4°, pulse 108. Tongue very furred. Vomited bile on admission. Epigastric tenderness	Fell by lysis	Oct. 13, a.m.	Nausea continued till Oct. 12. Some colicky pain with mucus in stools till Oct. 26	10.10.16 Soft. Patches of dull opalescent mucus, many white blood cells and epithelial cells, few red cells 18.10.16 Soft. Plaques of firm mucus as seen in mucous colitis 23.10.16 Soft fæces and further mucous plaques 27.10.16 Soft. Few pieces of glairy, but no firm placques of mucus	+ 10.10.16 + 18.10.16 — 23.10.16 — 27.10.16
6.10.16 p.m.	Nausea and shivering Oct. 7, diarrhœa, motion every half hour, headache, nausea	Temperature 101·2°, pulse 92. Perspiring very frequently, offensive stools	Fell by lysis	Oct. 10, a.m.	Rapid convalescence after Oct. 12	8.10.16 Liquid. Some flakes of glairy mucus, few epithelial cells, white and red blood cells 18.10.16 and later, soft. Normal	+ 8.10.16 — 18.10.16

Ten c.c. were taken from cases in hospital with raised temperatures. No growth resulted.

SUMMARY OF CLINICAL OBSERVATIONS.—*Continued.*

Date of onset of symptoms	Initial symptoms	Physical examination, etc., on admission	Character of temperature	Date when temperature first normal	Further progress	Character of stools with microscopic examinations. The consistency of the stool was most frequently attributable to the line of treatment	Result of stool culture for *B. aertrycke*	Blood cultures
7.10.16 a.m.	Headache, shivering, nausea, shooting pains in wrists and in ankles	Temperature 102°, pulse 104. Gurgling in right iliac fossa. Tongue very furred	Sharp fall ..	Oct. 9, a.m.	Shaky and easily tired up to Oct. 17. Thereafter uninterrupted recovery	9.10.16 Soft. Some flakes of mucus, white blood cells, rarer epithelial cells 18.10.16 and later, normal ..	— 9.10.16 — 18.10.16	Ten c.c. were taken from cases in hospital with raised temperatures. No growth resulted.
6.10.16 p.m.	Headache, shivering, pains in neck, abdominal pain, bowels loose but only two motions	Temperature 102·5°, pulse 96. Perspiring, slight epigastric tenderness, tongue very furred	Gradual fall	Oct. 11, a.m.	Rapid convalescence..	9.10.16 Fluid. Normal .. 18.10.16 Soft. Flakes of glairy mucus, white blood cells, epithelial cells. Later normal	+ 9.10.16 — 18.10.16	
6.10.16 a.m.	Diarrhœa, malaise, headache, aching all over by afternoon, vomited by Oct. 7	Temperature 102°, pulse 104. Tongue very furred	Gradual fall	Oct. 10, a.m.	Clinically appeared normal except that mucus was seen in stools up to 17th	8.10.16 Soft. Flakes of mucus, white blood cells, epithelial cells 18.10.16 Soft. Flakes of mucus, white blood cells, epithelial cells 23.10.16 Formed. Rare threads of mucus showing on the surface	+ 8.10.16 — 18.10.16 — 23.10.16	

6.10.16 p.m.	Diarrhœa (four motions in six hours), vomiting, headache and general aching	Temperature, 100·4°, pulse 92. Tongue very furred	Oct. 8, a.m., 99°; p.m., 99·8°	Oct. 9, a.m.	Rapid convalescence..	9.10.16	Soft. Flakes of mucus and of blood, many epithelial and white blood cells. Numerous non-motile thin small Gram-negative bacilli also present. No aerobic growth thereof	+ 9.10.16	Ten c.c. were taken from cases in hospital with raised temperatures. No growth resulted.
						18.10.16	and later, soft. Normal	– 18.10.16	
						9.10.16	Soft. Flakes of mucus, epithelial and white blood cells	+ 9.10.16	
6.10.16 p.m.	Abdominal pain, vomited once, bowels loose, general aching, shooting pains in limbs	Temperature, 102·4°, pulse 98. Skin hot and dry, slight epigastric tenderness, tongue furred	Oct. 9, 99·2°, with rise to 99° each evening	Oct. 12, p.m.	Oct. 9, spleen just palpable; Oct. 18, tongue clean. Patient shaky Thereafter rapid convalescence	18.10.16	Liquid. Very rare flakes of clear-looking mucus, white blood cells and epithelial cells. Later normal	– 18.10.16	
11.10.16 p.m.	Languid, feverish, slight colicky pain, following day diarrhœa and vomiting. Oct. 15, blood and mucus	Oct. 16, admitted Imtarfa. Temperature 99°, pulse 52, slightly irregular. Tongue furred, slight epigastric tenderness, stools loose	..	Normal Oct. 17, a.m.	Stools never frequent, but loose, with pain. Oct. 20, normal stool.	17.10.16	Soft. Streaks of mucus and blood, epithelial and white blood cells	– 17.10.16	
					Rapid convalescence	28.10.16	Soft. Normal	– 28.10.16	

followed in fifteen to twenty hours. The *B. aertrycke* was found generalized and was isolated in pure culture from the gall bladder, heart's blood and peritoneal fluid. The peritoneal cavity was full of an opaque watery fluid with strands of lymph especially over the liver. The exudate contained numerous cells. There was also an excess of pleural fluid. No other obvious changes.

Subcutaneous Injection.—Same dose. Death twenty-eight hours later. The animal appeared to be in great pain for half an hour prior to death, and showed convulsive movements. No diarrhœa. The *B. aertrycke* was again found to be generalized. No marked inflammatory condition existed at the site of the infection. Both peritoneal and pleural cavities showed excess of fluid which was turbid and showed strands of lymph and microscopically many cells and bacilli. Broth cultures were made, and after four weeks' growth were well centrifuged. One cubic centimetre of the supernatant broth unheated and heated to 80° C. for ten minutes did not lead to death or emaciation of the guinea-pigs, which were inoculated subcutaneously.

Feeding with almost a whole culture of a slope agar growth of twenty-four hours gave a negative result.

Agglutination and Absorption.—The importance of these reactions in the determination of the *B. aertrycke* and the question of its relationship to the *B. paratyphosus* B Group of micro-organisms justified some detailed investigation on these points during the favourable opportunity offered for research.

The following outstanding results are given as a summary of the research carried out. All patients had been inoculated with T.A.B. vaccine at a recent date, and agglutinins to the micro-organisms were present at the first examination of their blood sera two or three days after onset of the *B. aertrycke* infection. But agglutinin for the *B. aertrycke* isolated did not appear in any till after the sixth day, and was present in all cases on the ninth day. It persisted in fourteen out of the sixteen cases for one month, but in eight out of eleven examined after two months a very definite fall in amount was observed. The agglutinins for *B. typhosus*, *B. paratyphosus* B and *B. paratyphosus* A present in response to the inoculations were not obviously increased as the result of the *B. aertrycke* infection; and in three cases the titre for the *B. paratyphosus* B was less on some days on which the test was done and showed a fluctuation of marked degree. *B. enteriditis* Gaertner was not agglutinated by any of the patients' blood sera at any examination.

The sensibility to agglutination by specific antiserum shown by the colonies from positive stool cultures varied, and preliminary examination was made to select for experimental work that most true to type in its specific agglutinability in all patients' sera and in an animal anti-aertrycke serum prepared by inoculations of a known typical strain of *B. aertrycke*, and in being but slightly agglutinated in paratyphosus B anti-serum. This bacillus will be termed, *B. aertrycke* "Maltmann." It showed agglutination in the anti-aertrycke serum, 1/4,000 (the full titre of serum); anti-Gaertner serum 1/100 complete and 1/200 incomplete (titre 1/8,000); anti-paratyphosus B Schottmüller serum 1/800 incomplete (titre 1/8,000). Time, two hours at 37° C.

The absorption test results and method employed are tabulated.

In the absorption test on the sera of patients and inoculated people much care

must be taken to avoid errors of results and interpretations that may follow the supersaturation of human serum with bacterial emulsions. *The quantity of agglutinin present in a patient's serum for the micro-organisms to be tested should be determined, and a fixed quantity of agglutinin, as well as of the bacterial emulsion employed.* The technique has been described in a previous report to Command Headquarters.[1] It is based on the fact that when the supersaturation method was carried out on human sera emulsions of certain bacilli of allied and, in some instances, of non-allied groups have removed the specific agglutinin for another micro-organism *when this specific agglutinin was small in amount*. When the specific agglutinin content in the dilution of serum is great as it is in specific animal anti-serum of high titre the supersaturation method may be employed. As an illustration of the above statements an example from notes is given, following a table showing the absorptive activities of the strains employed tested with animal specific antisera.

Animal specific antiserum	24 hours at laboratory temperature	Agglutination after absorption		
		G	B	AM
Anti - Gaertner titre 1/8000	3 drops serum dilution 1 in 100 + 3 drops of *B. aertrycke.* "Maltman" emulsion	IC	Trace	—
	3 drops serum dilution 1 in 100 + 3 drops of *B. ent.* Gaertner emulsion	—	—	—
	3 drops serum dilution 1 in 100 + 3 drops of *B. paratyphosus* B emulsion	IC	—	—
Anti-paratyphosus B titre 1/8000	3 drops serum dilution 1 in 100 + 3 drops of *B. aertrycke.* "Maltman" emulsion	—	IC	—
	3 drops serum dilution 1 in 100 + 3 drops of *B. ent.* Gaertner emulsion	—	IC	Partial
	3 drops serum dilution 1 in 100 + 3 drops of *B. paratyphosus* B emulsion	—	—	—
Anti - aertrycke titre 1/4000	Dilution 1 in 50 + 3 drops of *B. aertrycke.* "Maltman" emulsion	—	—	—
	Dilution 1 in 50 + 3 drops of *B. ent.* Gaertner emulsion	—	Trace	IC
	Dilution 1 in 50 + 3 drops of *B. paratyphosus* B emulsion	—	—	IC

IC = Agglutination immediate and complete.

A patient examined early in the disease with a small quantity of specific agglutinin developed for *B. aertrycke*, and with large quantity of agglutinin specific for *B. paratyphosus* B due to inoculation.

Time	*B. paratyphosus* B				*B. ent.* Gaertner				*B. aertrycke* "Maltman"			
	1/50	1/100	1/200	1/400	1/50	1/100	1/200	1/400	1/50	1/100	1/200	1/400
Two hours at 37° C.	+++	++	+	—	—	—	—	—	+	+	—	—

[1] Later published in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, October, 1918.

Same serum after supersaturation with :	*B. paratyphosus* B				*B. aertrycke* "Maltman"			
	1/50	1/100	1/200	1/400	1/50	1/100	1/200	1/400
B. paratyphosus B..	−	−	−	−	−	−	−	−
B. ent. Gaertner	+++	++	+	−	−	−	−	−
B. aertrycke "Maltman"	+++	++	+	−	−	−	−	−

Another patient with a larger quantity of specific agglutinin for *B. ent. aertrycke* :—

Time	*B. paratyphosus* B				*B. ent.* Gaertner				*B. aertrycke* "Maltman"			
	1/50	1/100	1/200	1/400	1/50	1/100	1/200	1/400	1/50	1/100	1/200	1/400
Two hours at 37° C.	+++	++	+	−	−	−	−	−	++++	++++	++	+

Same serum after supersaturation with :	*B. paratyphosus* B				*B. ent.* Gaertner				*B. aertrycke* "Maltman"			
	1/50	1/100	1/200	1/400	1/50	1/100	1/200	1/400	1/50	1/100	1/200	1/400
B. paratyphosus B	−	−	−	−	−	−	−	−	++++	++++	++	+
B. ent. Gaertner	+++	++	+	−	−	−	−	−	++++	++++	++	+
B. aertrycke "Maltman"	+++	++	+	−	−	−	−	−	−	−	−	−

With the following technique which includes titration of agglutinin content of sera the results are very satisfactory, and lead to the elimination of certain factors of error which may occur in the supersaturation test on human sera.

Dilutions of the sera were prepared wherein the agglutinin actions thereof were respectively equal, and equal quantities of the dilution of serum necessary were employed. Standard emulsions of equal density (9,000 million bacilli to 1 cubic centimetre) were used. For standardizing the agglutinin content of sera my time governed agglutination method was employed. That dilution which showed agglutination of an emulsion on a slide in one minute was taken.

Supposing that for *B. paratyphosus* B it was 1 in 20, and for *B. aertrycke* it was 1 in 10, then the absorption test was carried out as follows :—

(A)	3 drops of serum,	1 in 10,	plus 3 drops of	emulsion,	*B. paratyphosus* B.
	,,	,,	,,	,,	*B. aertrycke.*
(B)	,,	1 in 5	,,	,,	*B. paratyphosus* B.
	,,	,,	,,	,,	*B. aertrycke.*

After contact for twenty-four hours at laboratory temperature, or eight hours at 37° C. and one or two shakings of the tubes during that time, or two hours at 55° C., each series A and B was tested for its agglutinability on the slide as before. *All* specific agglutinin may not be absorbed by this method; *co- or*

hetero-agglutinins are and the results show a complete absence or marked retardation of specific agglutins following the agglutination test similarly practised before and after the absorption test, and are easy of interpretation and accurate.

The dilution of serum to be employed for the absorption test can be selected from those used in an agglutination test carried out by the high titre testing methods while maintaining the principle of my quantitative method.

Group Classification.—The classification as *B. aertrycke* or *B. paratyphosus* B of a strain isolated during an epidemic wherein the majority of persons have presented signs of acute gastro-enteritis and some the signs and symptoms of a generalized septicæmia, may be difficult of determination, even with the aid of the absorption and agglutination tests.[1] The following experimental results are given in support thereof and for their practical interest.

The strain to be described is termed *B. wrexham*, and was given to me as the causal agent of the well known "food poisoning" epidemic that occurred there. The *B. wrexham*, when inoculated, produced agglutinins in sera which acted upon itself and not upon a *B. paratyphosus* B until the titre for the former became high. The converse findings were obtained from inoculation of a *B. paratyphosus* B stock strain. An emulsion of *B. wrexham* was tested for agglutinability at the same examinations as the stock strain of *B. paratyphosus* B with sera of approximately 100 cases of paratyphoid B infections. Five of these sera agglutinated the *B. wrexham* in a higher dilution than they agglutinated the *B. paratyphosus* B. The remainder agglutinated it in an equal or, much more frequently, in a lower dilution only.

The agglutination test on the sera of the first three cases of the above epidemic gave in brief these results (they had recently received T. A. B. vaccine) :—

Serum	*B. paratyphosus* B			*B. aertrycke* Maltman			*B. wrexham*		
	1/100	1/200	1/400	1/100	1/200	1/400	1/100	1/200	1/400
"U" ..	+	+	–	++++	+++	+	++++	+++	+
"W" ..	+	–	–	+++	+	–	++	+	–
"K" ..	+++	+	+	+	–	–	+	–	–

The absorption test on the first serum carried out by the supersaturation method showed that although the emulsion of *B. paratyphosus* B removed the agglutinin for *B. wrexham* the converse did not equally hold, and that *B. aertrycke* "Maltman" and *B. wrexham* had an absorbing fraction common to both.

Saturation of patient "U" serum with :	Agglutination after absorption		
	B. paratyphosus B	*B. maltman*	*B. wrexham*
B. paratyphosus B	–	+	–
B. aertrycke Maltman	+	–	–
B. wrexham	+	–	–
B. ent. Gaertner	+	+	+

[1] In the *Lancet*, August 24, 1914, I published experiments that showed that the inoculation of a strain of *B. paratyphosus* B produced agglutinin first detectable on itself and later, when increased, acting upon allied strains.

Comparative findings resulted from the test with the same emulsions and specific animal anti-sera :—

Saturation of anti-*paratyphosus* B serum with :	Agglutination after absorption		
	B. paratyphosus B	*B. maltman*	*B. wrexham*
B. paratyphosus B	−	+	−
B. aertrycke Maltman	+	−	−
B. wrexham	+	−	−
B. ent. Gaertner	+	+	+

Saturation of anti-*aertrycke* serum with :.	Agglutination after absorption		
	B. paratyphosus B	*B. maltman*	*B. wrexham*
B. paratyphosus B	−	+	−
B. aertrycke Maltman	−	−	−
B. wrexham	−	−	−
B. ent. Gaertner	Trace	+	+

In an outbreak due to one of the two groups the etiological findings and clinical manifestations, also post-mortem findings in a case of death, are factors of value in the classification of the causal strain as *B. paratyphosus* B, or *B. ent. aertrycke.* Biological and serological examinations of the strain will in the very great majority show that it belongs to that group with which experience has taught us to associate characteristic etiological, clinical and pathological findings. In the above described outbreak the clinical symptoms are characteristic of the infection and biologically and serologically the strain is *B. ent. aertrycke.* But in rare instances the conjoint picture is not so completely true to type. Each group has a number of strains or "types" and some of these show the close relationship of the two groups as serological reactions testify, and as we see with *B. wrexham.*

A case of *B. ent. aertrycke* infection *may* clinically present the signs and symptoms of an insidious onset, continued fever and septicæmia, and a case of *B. paratyphosus* B *may* show an acute onset of severe vomiting and mucous diarrhœa with fever and a toxæmia that is dependent upon the relative toxicity of the strain, the amount of infected material ingested and the length of time the bacillus has been living therein, and I have made a post-mortem examination on a man from whom a *B. paratyphosus* B conforming to type culturally and serologically, was isolated from the intestines, gall bladder, heart's blood and spleen, and the only lesion in the intestines was an inflammatory condition of the mucous membrane with congestion of the lymph follicles in the large part.

The ferment activities of strains on the cultural media generally employed are similar for both groups and show but rare variants from characteristic findings. Amongst about 300 strains examined I have failed to detect or produce motility in one, and this, moreover, needed repeated subculturing in dulcite-peptone water to produce acid and gas. It gave all other characters of *B. paratyphosus* B, and was isolated from the blood of a clinically paratyphoid fever case.

Summarizing, the two groups are closely allied and within each there exist

strains that vary in a slight or marked degree from type in biological, physical or chemico-physical activities. Amongst such intragroup varieties are strains which approximate in these activities strains of the other group, and thereby present a difficulty in classification. A discussion on the mutability or permanence of strains is not within the scope of this article.

In conclusion, I wish to mention the valuable assistance given me in the laboratory work by Q.M. Serjt. R. J. Dermody, R.A.M.C.

THE STAINING OF BLOOD SMEARS FOR THE MALARIA PARASITE.

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The type of smear most commonly used in searching for the malaria parasite is what is known as the "thin smear." Such smears are made as thin as possible, and stained with one or other of the Romanowski stains, most commonly the Leishman. For the examination of the morphological details of the parasite this is without doubt the ideal method according to our present knowledge, but for the routine examination of smears it has several drawbacks, the most outstanding being that when the parasites are scanty a lengthy examination is necessary before any parasites are seen at all. In many cases examined by this method it is only at the end of a long search that a parasite is seen, and one is left with the impression that a number of smears returned as negative would be found to contain parasites if a more prolonged search were made.

Many use the thick smear method in searching for crescents but it seems to be the exception for this method to be used as a routine for all types of malaria, yet this is the method one came to adopt, after very considerable experience in the routine examination of smears, as being at once the easier and more accurate method.

Technique of the "Thick Smear" Method.

A large drop of blood (many times as large as the drop used for making a thin smear) is received on a clean slide from the pricked lobe of the ear, and is spread over an area of from half to three-quarters of an inch square. This is dried, moderate heat being used to hasten the process if so desired. The slide is then covered with the following solution, which simultaneously hæmolyses the red cells and fixes the remainder of the smear.

Formalin..	20 parts
Glacial acetic acid	2 ,,
Aq. dist.	78 ,,

This is left for at least ten minutes. The colourless smear is then gently washed in tap-water (being somewhat fragile it is easily washed off) and stained either with borax methylene blue or Loeffler's methylene blue for two minutes or longer. It is then gently washed in tap-water, and is dried by heat—not by blotting—when it is ready for examination.

Appearance of the Smear.

When examined with the one-twelfth inch objective, such a smear is seen to consist of a greenish background, on which are blue-stained leucocytes, blood-platelets and parasites. Of the latter, the most typical, when present, is the crescent. This is stained a bright blue, and the dark pigment at its centre is very conspicuous. The benign tertian parasite can be recognized in any of its pigmented forms. It appears as a bluish-green body about the size of a leucocyte or less (as in the case of the younger parasites). The characteristic feature is the pigment, which is scattered through the parasite in little rods, more or less regular in size; by this it can easily be differentiated from a deposit of stain or any other artefact which may be present. Several such parasites can be seen without much difficulty as a rule, and these by their similarity rule out of court any question of artefact. Such forms have been shown to microscopists who were thoroughly familiar with the appearances of benign tertian parasites in Romanowski stained smears, and were immediately recognized.

Time of Taking Thick Smears.

As this method demonstrates the pigmented forms of the parasite, it follows that smears are best taken during the afebrile stage when pigmented forms are most common. In working by the thin smear method the best results are obtained by taking the smears during the pyrexial period, as parasites as a whole are more common in the peripheral circulation at this time; they consist chiefly of ring parasites, however, which cannot be recognized by the thick smear method.

In the case of subtertian malaria, crescents are usually present ten days from the onset, and are often found in the thick smears when the patient is showing no signs of the disease whatever.

Advantages of the Method.

(1) The technique of the method is simple. It is a common experience that during the very hot weather in malaria regions the Romanowski stains will not act. The preparing of grease-free slides for taking thin smears is often very difficult, yet is essential to give a satisfactory result; for thick smears the same degree of cleanliness is not necessary. Tap-water instead of distilled water can be used for washing the smears.

(2) The great advantage of the method lies in the concentration of parasites which is obtained. Each field looked at represents a large number of red cells, and consequently the parasites are much more numerous than they would be in a similar field in a thin smear. The amount of searching which has to be done is thus greatly reduced, as is also the chance of missing the parasites in smears in which they are scanty.

(3) The time at which such smears may be taken is usually a matter of convenience. One can take them at the morning visit, and thus obviate the necessity of taking smears at night, which being the usual time of the pyrexia is the best time for taking thin smears, yet is often inconvenient.

Disadvantages of the Method.

(1) The thick smear method is in no sense suitable for studying the morphology of the parasite. It is merely a means of detecting the presence of parasites.

(2) It is essentially unsuited for cases where there are unlikely to be pigmented forms in the circulation, e.g., in early primary cases of subtertian malaria.

CONCLUSION.

Except in early cases of subtertian the thick smear method described is the best method of ascertaining quickly and accurately the presence of the malaria parasite. It is of especial value in relapse cases, such as are seen in this country, where pigmented parasites are almost invariably present.

A METHOD OF CHOLERA DIAGNOSIS.

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The occupation of countries where infectious disease was known to be endemic, threw a great responsibility on those charged with the care and health of our troops. This was notably so in the case of cholera, and the measure of immunity that British troops enjoyed, is largely due to the unceasing vigilance that was exercised by all the medical authorities concerned.

In connexion with the Egyptian Expeditionary Force, Lieut.-Colonel C. J. Martin, C.M.G., dealt with the bacteriological side of the outbreak of cholera after the Battle of Raffa, and when our troops were advancing through Palestine, Captain Craig, Officer Commanding No. 1 Military Laboratory, was the first to isolate the cholera vibrio, and later, Brevet-Major P. Manson-Bahr, D.S.O., Officer Commanding No. 3 Military Laboratory, isolated the vibrio from a case in another area.

Shortly afterwards, a localized outbreak in this area among the civilian population, led me to consider the method to be adopted in the event of an epidemic occurring.

It seemed to me, that a technique, based on a microscopical examination of peptone cultures for organisms having the classical characteristics of the cholera vibrio and, or, plating out of peptone cultures on any selective or non-selective medium, was one that might not be sufficiently practicable and accurate, especially under the stress of a serious epidemic, taking into consideration the conditions that obtained in this area.

I therefore devised the following technique, which was used throughout the whole of the anticipated epidemic, which lasted over a period of eight weeks. The distinctive feature of this method is that *each* peptone culture is brought directly in contact with the specific cholera agglutinating serum: The details of the technique are as follows :—

(1) Put a platinum loopful of fæces into a test tube containing five cubic centimetres of ordinary one per cent peptone water (slightly alkaline to litmus).—Incubate for eighteen hours.

(2) From each of the resulting cultures, pipette one drop of the peptone water growth on to one of the divisions of a Garrow agglutinometer slab. (Twenty-four specimens can be conveniently examined on one slab.)

To each of these drops is added a drop of Lister cholera agglutinating serum (1/80 dilution).

The slab is then rotated for three minutes (at the rate of one revolution per second) so as to bring the drops of culture and agglutinating serum into intimate contact.

At the end of this period, the slab is removed and examined in a suitable light, when it will be found that cultures containing vibrios give well marked agglutinated clumps obvious to the naked eye.

The positive cultures are kept for further investigation, the negative being discarded.

(3) All the positive cultures are assembled, also bottles containing agglutinating serum in dilutions of 1/320 and 1/640.

Pipette on to the Garrow agglutinating slab one drop of the 1/320 dilution of cholera agglutinating serum ; one drop of the 1/640 dilution of cholera agglutinating serum ; one drop of normal saline.

To each of these drops, add an equal drop of the culture under examination. Rotate the slab for three minutes, remove and examine. Cultures containing vibrios give well marked agglutination clumps, obvious on naked-eye examination, i.e., the peptone culture contains cholera vibrios agglutinated by the specific agglutinating serum in a dilution of 1/1280.

(4) These positive cultures can be further investigated by plating them out on any suitable medium (e.g., MacConkey, alkaline agar, etc.) Suitable colonies are selected for subculture and subsequently for biochemical reactions.

NOTES ON TECHNIQUE.

It is important to ensure that the agglutinometer slab is as free from grease as possible and maintained in this condition. This is best done by washing the slab with soap and water, and then with alcohol and ether; finally polishing the slab with a clean silk handkerchief. If the slab is not kept absolutely clean, the drops fail to run evenly over the slab. Such "stickiness" was only experienced at the beginning of each day's work and it was therefore our practice to devote a sufficient amount of attention to the slab's toilet each morning before commencing the day's examination of peptone cultures.

Pipette.—An ordinary Wright's pipette with teat is selected which will deliver a drop of suitable size. The pipette is washed through with alcohol and ether between the examination of each peptone culture, so as to ensure a dry clean pipette for each specimen.

Agglutinating Serum.—Agglutinating serum diluted with the requisite quantity of carbol saline was kept in vaccine bottles fitted with the usual indiarubber caps. This indiarubber cap was cut half way round at the mouth of the bottle, so that on holding the bottle in the left hand and applying traction with the thumb, an opening sufficiently large to admit the introduction of the pipette was obtained. On releasing the thumb, the opening was closed by the elasticity of the rubber, so that loss by evaporation was prevented, and the necessity for using corks or plugs obviated.

Speed of Revolution.—This is of comparatively little moment, but it is important that the slab should be rotated evenly, as any jerkiness is apt to throw the drops off the slab.

Rapidity of the Technique.—It was found in the course of the epidemic, that readings could be made within ten hours of inoculating peptone water medium

with fæces. Had the cases been more acute, it is probable that readings could have been made much sooner. At the end of eighteen hours, it was ascertained that a reading of positive cultures could be made, even when the peptone culture was diluted with an equal volume of saline. The period of eighteen hours was adhered to, because this was the most convenient one, both for administrative and bacteriological purposes. Stools reaching the laboratory in the afternoon or evening were reported on by 12 o'clock on the following day. This arrangement enabled the medical officers in charge of wards, to examine their cases and to arrange for the dispatch of stools in the morning and for the segregation and treatment of cases returned as positive in the afternoon and evening. The laboratory routine consisted of examination of peptone cultures in the morning, the plating out and examination of plates in the afternoon, and the inoculation of peptone tubes with fresh specimens in the evening. Special arrangements could be made for any given case of urgency, but the afore-mentioned regular routine was adhered to as far as possible, so as to ensure orderly smooth running and regularity of team work.

Accuracy of the Technique.—In order to establish the accuracy of the technique, the first hundred peptone water cultures reported as positive were plated out on MacConkey medium. In each case the cholera vibrio was recovered from plates, and in each case the vibrio isolated gave the correct morphology and biochemical reactions of Koch's cholera vibrio. Each vibrio exhausted the full titre of the Lister cholera agglutinating serum used. No anomalous vibrios were found. The only slight variations were in the degree of acidity and the rapidity with which acid was produced in lactose and mannite. These first hundred plate cultures invariably corroborating the results obtained under Stage 3, it was therefore considered unnecessary to proceed to Stage 4, during the remainder of the epidemic.

Rate of Reporting.—Each worker can report on 150-200 specimens per day, for as many days as an epidemic lasts. The technique involves no mental strain. The rate of reporting depends chiefly on the number of peptone water tubes available.

Antagonism of Intestinal Organisms to the Cholera Vibrios.—A sharp scrutiny was kept on the peptone water cultures for evidence of the *Bacillus pyocyaneus* or other micro-organisms that might kill off the cholera vibrio during incubation.

The *B. pyocyaneus* was conspicuous by its absence, as far as could be ascertained from observations made both of plates and peptone cultures. During the early days of the epidemic, an emulsion of five cubic centimetres of fluid fæces was sown with a loopful of a peptone culture of cholera and kept on the laboratory bench. Subcultures in peptone water at weekly intervals for two months, invariably gave positive results on incubation, showing that the cholera vibrio had held its own with the other intestinal organisms for this period. These observations enabled us to accept stools for examination from different camps.

Microscopic Examination of Positive Peptone Cultures.—A considerable number of these peptone cultures which gave positive readings by my technique and from which the vibrio had been recovered from plates, were examined by the hanging drop method and stained films. Even at the end of the epidemic, when considerable experience had been gained, the vibrios present were recognized with difficulty. If reports had been sent out on such examinations, the error

would have been great and it would not have been possible to control the epidemic under consideration.

Possible Errors.—The stools examined in this epidemic were those of natives. Their dejecta being peculiarly gritty in composition, fine particles occasionally appeared on the slab, which might be mistaken for agglutination clumps. These however were readily differentiated, by noting that these particles remained in suspension and were not thrown down in the same way as were true agglutinated clumps. Further, these particles appeared in the control saline division. No real difficulty arose in reading such cultures.

The epidemic in which this technique was first employed lasted over a period of eight weeks, during which time over 5,000 stools were examined, vibrios being detected in the fæces of 173 persons.

Clinically the epidemic was marked by an absence of the usual features of cholera, most of the patients suffering from a temporary diarrhœa only. The vast majority of stools found to contain vibrios were solid in consistency. Had typical rice water stools been available for examination, it would have been interesting to observe whether a reading could be made by rotating equal drops of stool and agglutinating serum.

Post-mortem examinations did not usually reveal typical pathological lesions of cholera, but nevertheless the vibrio was frequently isolated from the contents of the small intestine, etc., of these cases, infection with the cholera vibrio being the terminal one evoking comparatively little local intestinal reaction.

Under the circumstances, therefore, it is claimed that the technique was submitted to a rigorous test, and that it proved to be a very accurate method of ascertaining whether vibrios are present in stools.

The bacteriological equipment is reduced to a minimum, and enables the bacteriologist to investigate an epidemic in any locality, however far removed from a well-established laboratory.

The amount of cholera agglutinating serum required is also reduced to a minimum. One cubic centimetre of the Lister agglutinating serum is sufficient for the examination of 1,000 stools.

In the Bandi "Method of Rapid Cholera Diagnosis," the suspected fæces is inoculated into peptone water containing agglutinating serum, but this method is modified on account of the too great expenditure of agglutinating serum involved for carrier examinations on a large number of cases. A preliminary and ordinary peptone water culture is made from the fæces and looked through after twelve hours. Those cases without vibrios are not proceeded with. Those with vibrios are inoculated into peptone water, containing cholera serum of two to three times its titre strength, and agglutination looked for after two hours.

This modification, in my opinion, economizes agglutinating serum at the expense of accuracy. It is especially desirable in the case of carrier cases, where vibrios may be comparatively few, to be independent of the necessity for microscopic examination for the preliminary selection of cultures.

At the end of the outbreak I sent a note of my technique to Dr. C. Todd, O.B.E., Director of the Central Bacteriological Laboratory (Department of Public Health), Cairo, who very kindly called my attention to the method which has been worked out by Otto (R.) at the Institut für Infektions Krankheiten, Berlin.

In this method peptone water preparations, after incubation for sixteen to

twenty hours, are streaked out on Dieudonné medium, one plate taking five streaks. It is found that only about ten per cent of the cases give a growth on Dieudonné, and these are tested with serum.

The primary labour saving device is the use of special boxes fitted with racks for the transport of the stool specimens. With the very large number of such racks as will be needed, ordinary incubators are useless, and Otto recommends heating an ordinary laboratory room, whose doors and windows close tightly, with one or more gas ovens filled with automatic regulators.

Agglutinations are carried out in drops arranged in double rows on glass slides, one row being of specific serum, and the other of normal serum, ten times less dilute than the specific serum employed. A platinum needle holding a small amount of suspected colony is stirred up, first into the drop of normal serum, and then is passed direct into its drop of specific serum.

Such a technique involves the use of plates, and a selective medium which, quite apart from the risks of its being too selective, may not be available in sufficient quantity or quality for controlling an epidemic of cholera in the field.

The uselessness of ordinary incubators is also a great disadvantage. A Hearson B 3 incubator will hold 2,000, 4-inch by $\frac{5}{8}$-inch tubes, as used in my method.

Further, Otto states that a return was usually possible in forty-eight hours. Given the conditions that obtained in Palestine, in my opinion, it would not have been possible to have controlled the epidemic if such an interval had elapsed before sending in our bacteriological reports.

In this outbreak no especial observations were made for para-cholera organisms, but given the necessary specific agglutinating para-cholera sera, this could easily have been accomplished.

It may be pointed out, in conclusion, that the method described in this communication is equally applicable to the detection of any other organisms, such as the enterica group, which are agglutinated by specific sera, provided a fluid medium, as suitable as peptone water is for the cholera vibrio, is employed for their growth.

ACKNOWLEDGMENTS.

The bacteriological work involved in this outbreak was shared with me by Captain William Rutherford, M.C., R.A.M.C., to whom I am very grateful. We had the good fortune to be associated with Captain N. B. Laughton, R.A.M.C., whose unfailing assiduity and co-operation were of the greatest assistance. To Captain Garrow, R.A.M.C., we owe a great debt, his agglutinating slab and technique being of inestimable value to us.

Pte. Goddard gave us the fullest support at all times, and Pte. Bartlett kept all laboratory records with exemplary zeal.

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Lecture.

LECTURE ON THE PATHOLOGY OF WAR POISON GASES.[1]

By LEONARD HILL, M.B., F.R.S.

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In poison warfare there are three paths of entry to the temple of the human body—the stomach, the skin, the lungs. The poisoning of food and wells is an old method, ineffectual in modern days when food is conveyed to an army by motor lorries and water by iron pipes. To poison a reservoir chemically is out of the question owing to the bulk of material required, bacteriologically very difficult owing to the natural process which cleanses water when kept in reservoirs from pathogenic germs.

Arrow poisoning is an old device, and the poisoning of bullets, e.g., by cyanide of potassium, so that every wound of the skin should prove fatal, seemed possible, but the enemy did not develop this line of attack.

In mustard gas, BB′-dichlor-ethyl-sulphide $(CH_2ClCH_2)_2S$, he found an irritant poison which attacked not only the eyes and breathing tubes, but the skin; both by the immediate effects and those due to the long persistence of this substance in ground contaminated by shell fire, he obtained a most offensive weapon, which the Allies had first to identify, and then meet by manufacture on a scale so enormous that the enemy would have been hoisted with his own petard if the Armistice had not occurred.

Mustard gas was effectual not so much by its deadly action on the lungs, as by causing great numbers of casualties and temporary disablements through its action on the eyes and skin.

To smoke out your enemy is also an old device, e.g., the use of sulphur burnt on charcoal braziers in a siege. Of the poisons which act through the lungs, there are those which, like carbon monoxide and prussic or hydrocyanic acid (HCN), do not act as an irritant on the pulmonary epithelium, but passing through this epithelium into the blood, poison the heart and central nervous system causing unconsciousness and arrest of respiration; and there are those which irritate the eyes, air passages and alveoli of the lungs and provoking exudation and œdema in these last quickly suffocate, or cause incapacity by producing less severe pulmonary lesions which may become secondarily infected by microbes and by their action on the eyes.

There was an eager expectation in those engaged in chemical warfare that some poison might be discovered which, entering into the blood through the lungs, would act with extraordinary potency and in very high dilution. This expectation was not, and does not appear likely to be realized, for it obviously requires far less weight of poison to act on the living cells which line the conjunctivæ of the eyes and the air passages of the lungs than to poison the blood

[1] Given at the Royal Army Medical College, in May, 1920.

and tissues of the body. Apart, then, from the vesicant action of mustard gas, by far the most potent poisons have proved to be those that act on the eyes and breathing passages.

In the case of prussic acid, supposed at one time to be so potent, a concentration of 1 in 2,000 of air (0·6025 milligramme per litre) was breathed by Barcroft for one and a half minutes with intrepid impunity, after preliminary experiments had shown that monkeys, which are much less susceptible than dogs to this poison, survived such exposure, and that unconsciousness precedes death for some considerable time, and recovery follows removal into fresh air during this time.

In the case of carbon monoxide it requires a combination of some 600 cubic centimetres with the blood of a man to produce his prostration. Breathing 0·3 per cent (3·75 milligrammes per litre) for fifteen minutes at the normal resting rate of respiration will effect this. Carbon monoxide as a product of combustion of explosives was a source of trouble in mines and "pill boxes" where machine guns were fired and necessitated the use of oxygen breathing apparatus and special devices for the ventilation of guns, but both it and prussic acid proved useless for offensive warfare owing to the high concentration required to incapacitate, and the non-production of minor casualties by sub-lethal doses.

The pulmonary irritants cause changes which usually become evident some hours after exposure, but in very high concentration they may cause the death of animals in a few minutes. Thus a rat and a rabbit placed five yards to leeward of a bomb containing phosgene were found dead within eight minutes of its explosion, and it was proved by control experiments that concussion was not the cause of death.

By some Admiralty experiments, which I helped to carry out before the war, it was proved that the explosion of large charges of gun cotton within a few yards of pigs, had no obvious effect on the animals,[1] so long as there were no loose objects about which could be converted into missiles.

Stasis and decomposition of hæmoglobin is evident in the blood vessels of the lungs of animals quickly killed by exposure to concentrated phosgene, and death appears to be due to this stasis and consequent asphyxia. Cats exposed to strong chlorine (1 in 700 to 1 in 2,500) may die in less than fifteen minutes, the blood becoming black from asphyxia and the arterial pressure falling rapidly.

Pulmonary irritants may act chiefly either on the air passages (dichlor-ethyl-sulphide), or on the alveoli (phosgene), or equally on both (chlorine). In the first case there is little or no œdema, but danger of the air tubes being blocked mechanically by the shedding of the mucous membrane. I have seen in the case of bromine poisoning, the bronchi of guinea-pigs entirely blocked by casts formed of membrane, forced off and drawn in by the violence of the respiratory efforts; asphyxia may thus be quickly produced by exposure to high concentrations. The necrosis both of air tubes and alveoli affords opportunity for the development of infective bronchitis and broncho-pneumonia in those who are not asphyxiated quickly by such blockage, or slowly by subsequent œdema.

Why one gas should more attack the air passages and another the alveoli is a

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[1] One or two died a day or so after.

matter of debate. In the case of diphenylarsenious chloride $(C_6H_5)_2As\,Cl$ used as a fume, very fine particles, some even of ultra-microscopical size, may reach the alveoli, while coarse ones are filtered off in the air passages. A fume particle settling on the mucus covering a ciliated cell obviously produces locally a solution of poisonous concentration.

If a gas is very soluble, such as ammonia, it is caught by the moisture of the air tubes.

That chlorine gas first passes into solution and reaches a lethal concentration by solution before it acts, I proved on preparations of ciliated epithelium. Water containing 1 part in 40,000 stops the action of the cilia, while 1 in 100,000 is intensely irritating to breathe.

Phosgene probably acts at the moment of its decomposition by hydrolysis into CO_2 and HCl, the chlorine atom then becoming nascent and active. The decomposition by the wet membranes not being immediate, phosgene has time to reach the alveoli and do its work there, where the film of protecting water is so thin. There is no evidence that any of the pulmonary irritant gases have a greater affinity for the epithelium of the air passages than for that of the alveoli. The ease of decomposition and the local concentration are, I think, the determining factors. There is no evidence that the pulmonary irritants used in warfare, with the possible exception of dichlor-ethyl-sulphide and phenyl arsenious chloride and similar arsenic compounds, pass into the blood or exert any action other than that on the pulmonary membranes which occasions want of oxygen. Proof for this statement is as follows: I ground up the lungs of animals poisoned with chlorine or phosgene, and extracted them with Ringer's solution. This extract had no toxic effect on injection. The œdema fluid taken from the poisoned lung I also found to be non-toxic, so too serum through which phosgene has been bubbled. The intravenous injection into normal animals of serum taken from animals poisoned with chlorine or phosgene is without any specific effect. Chlorine or phosgene dissolved in Ringer's solution and injected produces no toxic effect (Bayliss, Douglas); so too with chloropicrin injected subcutaneously (Peters).

By introducing a catheter into one main bronchus of a cat and distending a small rubber bag, I temporarily blocked the entrance to one lung, and then poisoned the other lung by letting the animal breathe phosgene. On removing the catheter the animal breathed with its sound lung, the heart then showed no sign of poisoning, the pulse and blood pressure being normal. In one or two cases the œdema fluid from the poisoned lung rising into the trachea subsequently drowned the sound lung. In the other cases the animal recovered completely, and the poisoned lung appeared some weeks later normal, save for a slight lessening of the elastic recoil, after distension, in comparison with the normal lung.

In the case of dichlor-ethyl-sulphide the damage of the bronchi and bronchioles is severe and lasting; the œdema long and persistent; the subsequent infection and broncho-pneumonia severe. No evidence of remote effects of the poison on other organs is found after inhalation.

The severity of the lesions in the upper air passages and œdema of the lungs are marked features after inhalation of the phenyl arsenic compounds. The lesions in the lungs amply explain the cause of death from these poisons, and there is no reason to suppose any toxic effect on other tissues due to their absorption into the blood.

Fig. 1.—Normal lungs of goat. The lungs are in the collapsed condition in which they appear when the thorax is opened. Note appearance of lobulation on dorsal surface. (Dunn.)

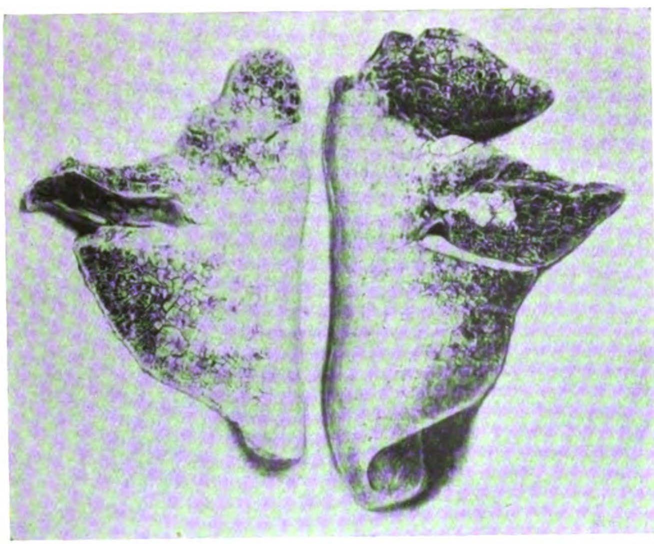

Fig. 2.—Lungs of goat one hour after exposure to phosgene (1 in 2000, 20 mins.). The appearance of lobulation is unduly distinct as a result of œdematous thickening of the interlobular planes. The centres of the lobules, especially in the projecting ventral parts of the lobes, are reddened by early alveolar œdema. The lungs have collapsed almost normally. Lung-heart ratio, 3.2/1. (Dunn.)

To illustrate "The Pathology of War Poison Gases," by Leonard Hill, M.B., F.R.S.

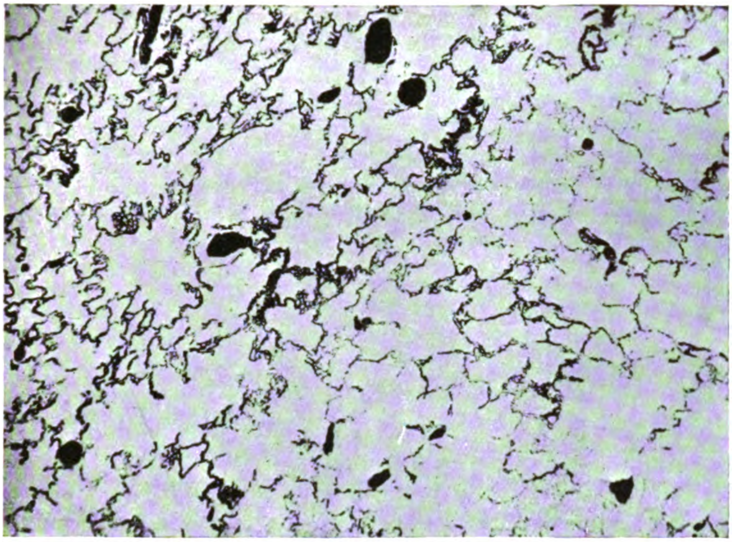

FIG. 3.—Gelatin injection of goat's lung 29 hours after exposure to phosgene; the mass was injected through the pulmonary artery. The section is unstained so that only the injected vessels are seen. In this area œdema was severe, but not completely solid. The injection of the capillary network is fairly complete. (Dunn.)

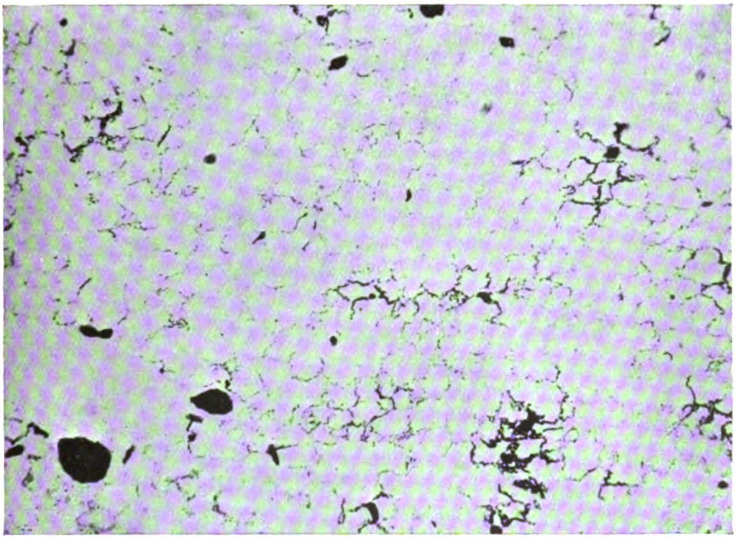

FIG. 4.—Gelatin injection of goat's lung 29 hours after phosgene. This area was taken from the same lobe as that shown in Fig. 3, but here œdema was complete. The injection of the capillaries is notably imperfect. (Dunn.)

To illustrate "The Pathology of War Poison Gases," by LEONARD HILL, M.B., F.R.S.

There is evidence that when dichlor-ethyl-sulphide is injected under the skin it produces conjunctivitis and bronchitis (Haldane). Mustard gas blister fluid is said to be poisonous, e.g., it may produce erythema of the skin upon which it is spilt. The arsenic war poisons inhaled as dust by factory workers have produced symptoms of chronic poisoning.

The acute results produced by pulmonary irritant gases are to be ascribed to want of oxygen; the late results to degeneration of the body tissues produced by such want; the acute results in addition may be due to shock produced by the absorption of the products of tissue destruction, just as in the case of a severe burn, a destruction enhanced subsequently by microbic infection.

The rapidity with which pulmonary lesions are produced and their severity, vary with the concentration of the gas used, and the duration of exposure, and a characteristic curve may be plotted for each gas relating these two factors with effectiveness in causing death. The onset of œdema may be almost immediate or delayed for several hours; the amount of œdema may be intensified by muscular exercise. An outflow of lymph in the lungs normally bathes the epithelium, and the drainage of this lymph is provided for by lymphatics, which arising in the alveolar wall pass to the lymphatic system of the pulmonary pleura, or in the interlobular connective tissue and the connective tissue coat of the arteries and bronchi. Normally drainage balances production, and the film of fluid is kept of such tenuity that, while the diffusion of the outgoing carbon dioxide is favoured, that of the ingoing less soluble oxygen is not impeded. The presence of even slight excess of fluid on the alveolar surface may lessen the oxygen supply of the tissues. Such an excess is produced by the irritating effect of a poison gas. The increased outflow of watery secretion is the natural method of diluting a poison in any part of the body, e.g., the swelling following a mosquito bite, the outflow of saliva produced by vinegar in the mouth, of mucus in the stomach on taking enough sugar to endanger the life of the epithelium by its high concentration, the water evacuations of cholera, etc. So in the case of the eyes and breathing tubes the irritation of the poison gas is met by an outflow of secretion, and the epithelium is not poisoned until the concentration rises in that fluid outflow to the lethal degree. The breathing of cool air which, because of its coolness, is of low humidity (absolute) enhances evaporation from the respiratory membrane; exercise may increase the volume breathed five times, or more if very strenuous; it follows then that the natural outflow of fluid through the membrane is closely dependent on absolute humidity of the air breathed and on exercise, and that rest in bed in a comfortable, warm and still atmosphere reduces the outflow to the lowest limit. Those who suffer from chronic bronchitis, i.e., have a chronically infected bronchial membrane, dislike cool, dry atmospheres—which are most healthy for normal people—and do best in warm climates.

There is a latent period in the establishment of œdema after breathing of phosgene, because the chemical changes in the epithelium resulting from the slighter degrees of poisoning, which call for the greater outflow (increased cellular inhibition) are only slowly brought about, and increased drainage may for some time balance increased outflow. Œdema once established may disappear again when the rate of drainage once more over-passes that of outflow. The respiratory movements keep up the direction of flow from alveoli to lymphatics, and exercise by increasing enormously the respiratory exchange, enhance correspondingly, we

may believe, the outflow of lymph which probably takes an essential part in the normal respiratory exchange.

When œdema is established respiratory movements may drive the fluid from a damaged part into the breathing tubes of a normal or less damaged part.

The coagulation of the œdema fluid in a damaged part of the lung has an important function in splinting the lung, and so allowing rest and repair (Cummins), just as the artificial pneumothorax treatment by shrinking up and putting an actively infected tuberculous lung to rest, allows the immunizing powers of the body to gain the victory. At equal periods of time after the same sub-lethal dose of phosgene has been breathed, animals show staged conditions which are fairly uniform; in the early hours there is distension of lymphatics but no œdema; in the latter hours increased distension of lymphatics and some œdema. In some cases drainage almost equals or surpasses outflow and œdema is slight or absent. After the forced exercise of poisoned animals which has brought about death there may be great œdema with little distension of lymphatics (Edkins and Tweedy). The amount of œdema fluid in the lungs in one fatal human case was estimated to be one litre or one-fifth of the blood volume.

I was told at Bailleul in 1915 that men, poisoned by the first gas attack, hung their heads over the side of the bed to let the liquid run out by gravity. In one fatal case two litres of fluid were coughed up in an hour and a quarter (Haldane). There was found a litre of fluid in the œdematous lung of a goat; that is between three and four-fifths of the blood volume. Such figures show how great is the drain of fluid from the tissues into the blood and thence into the lungs, and the danger of concentration of the blood arising, and increasing its viscosity, and thus impeding the circulation and still further lessening the supply of oxygen. The concentration of the blood is shown by the increase in the count of red corpuscles, which bears a rough relation to the extent of the œdema (Barcroft and Dufton). To meet this concentration drink must not be withheld, but supplied in accordance with the patient's desire. It is to meet the danger of concentration that bleeding and injection of gum saline have been tried as methods of treatment. In the early days of gas warfare I suggested there should be a trial of saline injections, but the fear of increasing œdema prevented the committee of English physiologists from acting on this suggestion. Finally some evidence of the advantage of such injections was brought forward by the American researchers.

The amount of œdema is best estimated by the ratio of the weight of the lungs to the heart. This is normally 1·5—3 to 1. It may rise to 12 to 1 through œdema.

Just as in any inflamed part, within an hour or two of exposure to phosgene, the number of polymorphonuclear leucocytes in the lungs is greatly increased. Many of these pass out into the œdema fluid. Large mononuclear cells of phagocytic power appear later, and reach a maximum on or about the third day. They arise from the alveolar epithelium, and are the same cells as those normally engaged in the lung in clearing up inhaled dust particles and bacteria; they contain dark particles derived from decomposed hæmoglobin. An invasion of eosinophil cells follows on the third to fifth day.

The pulmonary blood-vessels being congested in less, thrombosed in more

poisoned parts, the œdematous parts are cut off from, while the parts still in respiratory action obtain, a full supply of blood. Hence the blood passing through the poisoned lungs is oxygenated, not a mixture of arterial and venous blood (Barcroft and Dunn). Injected specimens of œdematous lungs show that few capillaries are patent in the areas of œdema. Adjustment of the circulation is made by vaso-dilatation of pulmonary vessels in the less damaged and normal parts. Thus the pressure is found to be normal on passing a needle into the right heart of a poisoned goat. The severely damaged parts are put out of action, splinted by œdema and left to the repairing influence of the leucocytes and epithelial phagocytes, while the body secures a supply of oxygen from, and a circulation through the undamaged parts. It is clear that the first necessity for cure is that the patient should rest, and not through exercise increase the oxygen need, or the expansion of his lungs. The oxygen need may be ten times as great during exertion as during rest, and the normal lungs and circulation are adapted to meet this demand. During rest in bed then a very small proportion of lung suffices for meeting the circulatory and respiratory needs of the body, provided that blood, which cannot be oxygenated in the œdematous parts, is prevented from circulating through these parts.

Fluid may collect not only inside but outside the lungs, in the pleural and pericardial cavities. I found that the œdematous lung of a rat when excised and placed in a watch-glass, shrank like a blood-clot, so that next day it lay in a bath of serous fluid; in effecting this shrinkage, the elasticity of the fibrin and the living tissue both come into play.

In the lung-heart preparation it was very noticeable how phosgene attacked certain areas and not others of the lungs in which artificial respiration was established. Poisoned parts became purple owing to congestion and stasis, other parts remained pale and normal in appearance. I attribute the difference to constriction of bronchial tubes shutting off certain portions. Gas-poisoning helps to reveal what seems to be a normal function of the lung, i.e., to be in action during rest, not as a whole but in parts. Some observations which I made with F. Twort on the amount of oxygen in the blood, taken from a vein in the fore-arm when lying at complete rest, seemed to show that the blood was not so fully oxygenated when breathing air quietly as when breathing deeply, and suggested that parts of the lung are not expanded during rest. The lungs open on inspiration like a Japanese fan (A. Keith), and their opening out is effected better in the upright than in the recumbent posture, hence the orthopnœa in cases of heart disease, etc., where there is oxygen want (Haldane).

Constriction of the bronchioles has been observed in animals on inhalation of phosgene (Golla), but not in the case of chlorine (Bayliss). To overcome bronchial spasm in gas-poisoned men the use of atropine was suggested, but the evidence is against it being of any value; it is disadvantageous to lessen the vagal control, and increase the rapidity of the heart by this drug. In badly gassed animals or men oxygen want ensues, and the struggle for breath may result in the tearing of the alveolar walls both in œdematous and unflooded areas. Such tearing and consequent areas of emphysema results particularly in chlorine poisoning, whereby the larger respiratory tubes are obstructed by destruction of the epithelium and exudation.

In the badly gassed animal there appears all the signs of oxygen want,

and this led me, very soon after the first gas attack, to try oxygen and compressed air on poisoned animals, and in consequence to recommend the use of oxygen as the one effective method of treatment. The human subject of gas-poisoning, in whom the vaso-motor system is not exhausted, exhibits blue or plum-coloured cyanosis with full pulse and distension of the veins. In those, on the other hand, in the state of shock suffering from general dilatation of capillaries, stagnation of blood within them, and leakage of fluid into tissue spaces, the appearance is ashy-grey in colour, and there may be no signs of intense breathlessness or distress because the respiratory and other nervous centres are failing from oxygen want, and unconsciousness is coming on.

Carbon dioxide is about twenty-five times as soluble in water as oxygen, and hence passes through the alveolar wall, with a given difference of partial pressure, far more easily than oxygen. Any slight increase in breathing, excited by the least increase of hydrogen ion concentration in the blood, very greatly increases the small difference of partial pressure on which the diffusion of carbon dioxide depends, but the same increase in breathing produces only a slight proportional increase in the diffusion pressure which drives oxygen inwards (Haldane).

Hence there may be cyanosis and oxygen want without any marked hypernœa excited by excess of carbon dioxide. People vary, as shown by experience of mountain (altitude) sickness, in the susceptibility of their respiratory centre to oxygen want. While some become blue before their breathing is increased, the respiratory centre of others reacts to slight anoxæmia, and these are thus better protected.

Failure of the respiratory centre is the ultimate cause of death from anoxæmia. A severe degree of oxygen want so paralyses the nerve centres that the experimental closure of the wind-pipe in the gas-poisoned animal does not provoke muscular spasms, slowing of the pulse, or rise of blood pressure as in the normal animal. Not only are the nervous centres narcotized and depressed in action by oxygen want, but the tone and contracting power of the heart are weakened, and this organ passes into a state of dilatation. General dilatation of the capillaries and pooling of the blood and tissue fluids in dependent parts, resulting from absorption of the products of tissue destruction, intensify oxygen want and lead to the failure of the nervous centres and heart. Degenerative changes, very varied in kind, may result from oxygen want which is severe, but not fatal in degree; thus there may ensue severe headache, various forms of paralysis, vasomotor disturbances, disordered action of the heart, albuminuria, etc.

Oxygen want increases the susceptibility of the respiratory centre to carbon dioxide. It was shown by Flack and myself that both a much greater and a much lower partial pressure of CO_2 in the alveolar air could be endured if oxygen were breathed in place of air. If the breathing be augmented as the result of gas-poisoning, CO_2 will be washed out of the blood and bicarbonate of sodium in the blood will become carbonate of sodium. The kidneys and other tissues, by removing carbonate of sodium from the blood, tend to preserve the neutral reaction; owing to such removal of the carbonate of soda the power of the blood to fix CO_2 is reduced. The condition, however, is not one of acidosis as has hitherto been supposed, but alkalosis (B. Moore), for the acid in the blood and tissues is reduced by the increased breathing

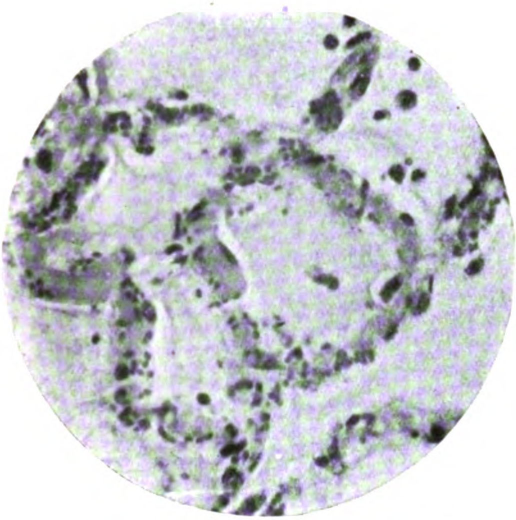

FIG. 5.—Thrombosis of capillaries as seen 36 hours after exposure to phosgene. The capillaries are widely dilated and their lumina are filled by dense homogeneous masses. Numerous red corpuscles, which in the goat are of very small size, are entangled in the thrombi, appearing as dark dots. (Dunn.)

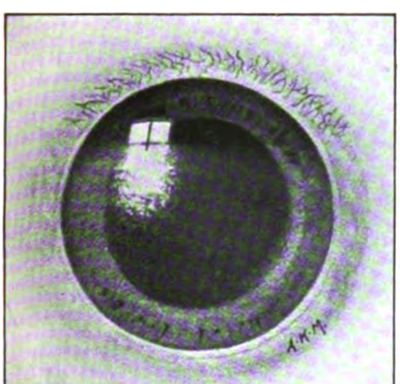

FIG. 6.—Eye, acute stage of "mustard gas" poisoning, cloudy opacity of cornea and œdema and occlusion of vessels in conjunctiva, except above where protected by lid.

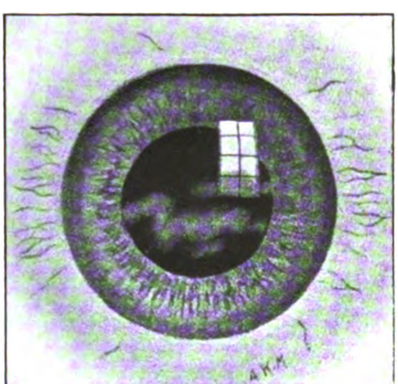

FIG. 7.—Stage of resolution. Vascularity in conjunctiva re-established and œdema disappearing.

(Drawn by Maxwell.)

To illustrate "The Pathology of War Poison Gases," by LEONARD HILL, M.B., F.R.S.

out of CO_2. The breathing centre becomes quieted down in its action by the reduction of the hydrogen ion concentration of the blood. Thus the breathing of 0·5 per cent CO_2 is found to be beneficial in altitude sickness, and may be of benefit in cases of oxygen want arising from irritant gas-poisoning or pneumonia, for it enhances the breathing and the intake of oxygen. On the other hand it must be remembered that quiet breathing allows the damaged lung to be at rest, "splinted" by œdema—quiet breathing is Nature's method of cure. Oxygen want leads to the production of lactic acid in the muscles, and this acid has been found both in the blood and urine after severe athletic efforts.

In gassed animals Barcroft finds the oxygen combining power of the hæmoglobin is lowered and attributes this to an acidosis produced by oxygen want, which is intensified by exercise. The passing of lactic acid into the blood occasions deeper breathing and washing out of CO_2, the respiratory centre and the renal mechanism together control the hydrogen ion concentration of the blood and strive to keep it normal. American observers find that the action of chlorine inhalation in lowering the power of the blood to combine with CO_2, may be antagonized by doses of morphine which keep the respiratory centre in quiet action, but this has no favourable effect on the animal (Hjort and Taylor).

Flack and I found in a research on ozone (*Proc. Roy. Soc.*, B. 1911) that inhalation of one part in five million causes white rats to erect their fur, hunch up and keep quiet, and lowers their rectal temperature 3° C.—their metabolism being reduced so as to relieve the lung as much as possible from respiratory function.

It has been found by observers in U.S.A. that low irritant concentrations of chlorine (24 to 30 parts per million) increase the body temperature of dogs, probably through excitement to escape; medium concentrations (180 to 200 parts per million) decrease the temperature and slow the pulse. Lethal concentrations (800 to 900 parts per million) have a similar effect which exists after exposure. The slow pulse becomes weak and rapid within a few hours and collapse ensues. Animals gassed with lethal doses become unable to regulate their body temperature against either a moderately warm or cool environment. An over-warm atmosphere then may be as dangerous as one which is too cool in treatment of severely gassed cases.

In cases of acute irritant gas poisoning which die in two or three days there is no histological evidence of changes in the myocardium, but great rapidity of the pulse is a symptom in many cases, and one which in the early stage is improved by administration of oxygen—the heart diminishing in frequency and increasing in strength. In cases in which the pulse remains slow, the least exercise produces acceleration. Accentuation of the second sound of the heart often noted in the first few hours after gassing, is probably due to more vigorous contraction of the right side of the heart and raised diastolic pressure in the pulmonary artery.

Tachycardia is a persistent symptom, especially on taking any exercise in cases which are convalescing, and is mitigated by oxygen treatment. Vasomotor instability ("effort syndrome") is also common in gassed cases; in how many cases this condition may have existed before the exposure to gas is uncertain.

The mean blood pressure may fall fifty per cent in cats breathing strong concentrations of chlorine. It may be restored by intravenous injections of

gum-saline, but not by injections of physiological saline (Bayliss). In the case of phosgene administered to one lung I found the blood pressure fell, while the animal breathed with this lung, to be restored on allowing the animal to breathe by the normal lung. Pulmonary stasis and want of oxygen may both come into play. It must be borne in mind that extensive œdema of the lungs withdraws from the blood, and so from the tissue fluids a large amount of water, and this brings about a concentration of the blood and increased resistance to flow due to greater viscosity. Hence, as mentioned above, some hours after gassing there occurs a large increase in the number of red corpuscles per cubic millimetre. Shock leading to stasis and escape of fluid from the capillaries intensifies the concentration. A polycythæmia due to increased formation of red corpuscles may be excited by oxygen want in cases which survive, and are on the road to recovery. Such a compensatory adjustment follows chronic oxygen deficiency, however produced, e.g., by residence at a high altitude, chronic CO poisoning, etc.

The physiological and pathological facts detailed above point to bleeding and injection of gum saline as a line of treatment useful in sthenic cases of irritant gas poisoning which show blueness and venous congestion; oxygen breathing and rest in a temperate atmosphere are indicated as the immediate treatment useful for all severe cases; rest alone sufficing for mild cases.

HEALTH CONDITIONS IN EASTERN EUROPE—TYPHUS A SERIOUS MENACE.[1]

By F. NORMAN WHITE, C.I.E., M.D.

Medical Officer of the Ministry of Health, acting as Medical Commissioner, Typhus Commission, League of Nations.

A CHADWICK lecture on "Health Conditions in Eastern Europe—Typhus a Serious Menace," was delivered by Dr. Norman White at the Surveyors' Institution, Westminster, on July 15. The countries considered were Latvia, Esthonia, Lithuania, Poland and the Ukraine, all situated on the west border of Soviet Russia. Chief consideration was given to Poland, this being the largest State under consideration, through which pass the main lines of communication between Russia, with its deplorable health conditions, and western Europe. Poland, moreover, has suffered more from epidemic disease than have her smaller neighbours, and the strenuous efforts made by Poland to work out her own sanitary salvation entitle her to special consideration. The health problems of Poland's neighbours are, however, similar in kind.

Sanitary conditions in this part of Europe were in a deplorably backward condition even before the war. As was to be expected, outbreaks of epidemic disease closely followed the outbreak of hostilities in 1914. For the next four years the area under consideration was the scene of almost continuous fighting, and even now, in a large part of the area, war is being waged between Poland and Soviet Russia. Health conditions went from bad to worse, and in 1917 the death rate

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[1] Chadwick Public Lectures, London, 1920. Sir William J. Collins, K.C.V.O., M.D., Chairman of the Chadwick Trustees, in the chair.

exceeded the birth-rate in every town and district of Poland. Since the armistice there has been little, if any, amelioration.

A large part of the lecture was devoted to the consideration of typhus fever, a virulent epidemic of which still prevails, especially in Galicia. Statistics demonstrating the severity of the outbreak were given. The lecturer briefly described the part played by the louse in the transference of infection of typhus fever from the sick to the healthy. Conditions in Poland and neighbouring countries are at present most favourable to the spread of the disease. Soap, fuel, and other facilities for cleanliness are unobtainable in many parts of the country; changes of clothing are difficult to obtain; lousiness among the poorer classes is almost universal; privation, want, and disease have lowered the resistance of the population to infection. Overcrowding is rife; in Congress Poland 325,000 houses were destroyed during the war, and in Galicia 438,000. A continuous stream of refugees from Soviet Russia cross the border, many of them infected with typhus, nearly all of them infested with vermin, most of them clothed in rags which fall to pieces if attempts be made to disinfect them. The lecturer explained how impossible it is for the local health authorities to deal adequately with the situation, unaided.

Emphasis was laid on the danger to other countries arising from the persistence of this focus of epidemic disease, and the experience of Holland in 1918-19 was cited as an illustration of this danger.

The relationship between the health conditions and the economic conditions in this part of Europe was discussed, and it was argued that improved economic conditions are almost impossible in existing health conditions. The important part played by disease in the production of industrial and social unrest received consideration. Reference was made to the permanent disabling effect that the present prevalence of disease is likely to have on the rising generation.

It was pointed out that these countries are endeavouring to act as guardians of the health of the West.

The conclusion is that every country in the world has a very real and lively concern in the existing health conditions in Eastern Europe, quite apart from humanitarian considerations.

The essential requirements for the anti-typhus campaign were briefly described, and it was pointed out that unless foreign assistance be forthcoming soon, and in generous measure, the situation is likely to get altogether out of hand.

Tribute was paid to the numerous voluntary organizations which are rendering much needed help in coping with a very dangerous situation.

A demonstration of lantern slides concluded the lecture.

Current Literature.

Infectious Disease: Bed Isolation of Infectious Diseases in Fever Hospitals.—In *Public Health* for May, 1920, Dr. J. T. C. Nash, C.M.O., Norfolk, revives the question of bed isolation in fever hospitals. The author points out that Dr. Crookshank's contribution to the subject as published in 1910 was preceded by his own article on "Scarlet Fever and Diphtheria from a Public Health Point of View," published in the *Practitioner* on January, 1909. In that article Dr. Nash insisted on the following points:—

(1) The strict limitation of the numbers admitted to a fever hospital.

(2) Recognition of the principle that "in a common ward each patient, to a certain extent, is a source of possible detriment to others."

(3) Careful supervision and instruction of nurses with reference to their duties, so that they regard each patient as possibly harbouring some form of infection which might be transferred to another.

(4) Antiseptic precautions in which the nurse or medical attendant disinfects the hands, etc., before attending each patient.

In his address delivered before the Royal Society of Medicine on January 28, 1910, Dr. Crookshank raised the question whether in small hospitals, at any rate, cases of scarlet fever and diphtheria and measles, etc., might not be safely treated side by side; he also showed that he had himself at Mortlake treated cases of diphtheria, typhoid fever, erysipelas and puerperal fever in one ward—treating each case with surgical precautions.

In 1912, a paper on the "Bed Isolation of Cases of Infectious Diseases," by Drs. Rundle and Barton, was published in the *Lancet* (Vol. ii, p. 720). The predominant note of the paper was insistance on surgical cleanliness.

The routine of Dr. Rundle's method (which closely resembles that of Dr. Nash), was described in an address by Dr. Rundle before the Royal Society of Medicine in April, 1912, and the chief points in the procedure are traversed in the article under review.

Dr. Nash re-affirms his belief in the prime importance of sufficient cubic space for each occupant of a fever hospital; not less than 2,000 cubic feet as the L.G.B. "wisely insisted." He doubts, however, whether some diseases, like chicken-pox, are spread by aerial convection, and thinks that the nurse is generally to blame and possibly, on occasion, flies.

Dr. Rundle's experience at the Fazakerley Hospital, Liverpool, is quoted in justification of his scepticism concerning the spread of chicken-pox by the air.

It seems that at Fazakerley forty-one cases of varicella were treated in the "bed isolation ward" during 1910 and 1911 without a single instance of cross infection occurring.

On the other hand, varicella was accidentally introduced into the ordinary wards on twenty-one occasions during the same period of time, and cross infection occurred in every instance but one.

Influenza: (A) Ætiology.—In the June number of the *British Journal of Experimental Pathology*, Paul Fieldes and James McIntosh conclude their critical review of the ætiology of influenza (159-174).

(1) Despite the remarkable unanimity with which investigators in nearly every country have been attracted with the *concept of an ultra-microscopic virus* as the cause of influenza, the authors consider that this theory can no longer be accepted on scientific grounds.

"The positive results of the filter passing work upon influenza are unconvincing. The characteristic microbe adduced is indistinguishable from undoubtedly inanimate particles which are found in albuminous fluids. The attempts to demonstrate life in these consist in observing the development of cloudiness in other albuminous fluids after inoculation with the particles; . . . we ourselves when engaged upon other work have seen such opacities develop spontaneously in Noguchi medium."

"Arkwright, in his attempt to grow the virus of trench fever and influenza in Noguchi's medium, observed these opacities in inoculated or uninoculated tubes."

The authors state that Arkwright examined the preparations and cultures of Bradford, Bashford and Wilson, and found that the bodies described by these investigators as the virus of influenza and of other diseases were identical with the bodies in uninoculated tubes. Also the cultures said by them to be pure were considered by Arkwright to be contaminated with ordinary bacteria.

(2) As regards the *incidence of B. influenzæ* in influenza, the authors consider that, with a satisfactory technique (particularly altered blood as opposed to unaltered blood for the growth of the bacillus), the bacillus can be "demonstrated in such a large number of cases that it qualifies for being considered of ætiological importance as far as Koch's first criterion is concerned."

It is accepted that the bacillus is also found in a large number of conditions not influenzal and in many normal persons during epidemic periods, but these facts are not considered to invalidate the general proposition.

(3) "An association of *superimposed infection of various other bacteria* (pneumococci, staphylococci, streptococci, etc.), which resulted in an increased virulence of the disease, was a feature of the recent epidemic."

(4) "Though there is no satisfactory evidence that *B. influenzæ is pathogenic to man* so far as the inoculation of cultures go, nevertheless the constant occurrence of antibodies to this bacillus in the serum of patients makes it clear that it has a definite pathogenic action which cannot, however, be reproduced. The presence of the antibodies may be taken as evidence that the bacillus is a pathogenic bacillus such as might be the cause of influenza, but not that the characteristic lesions of the disease are due to this pathogenic bacillus."

(5) As regards *evidence of pathogenicity to animals*, the authors think that "fairly constant lesions may be produced by certain cultures applied in particular ways to susceptible animals. The most characteristic lesion to be observed is a broncho-pneumonia."

(6) The authors finally conclude that:—

"In the absence of precise knowledge, then, we may define influenza as an infective illness which is extremely difficult to transmit wilfully to another person. Its characteristic lesion is an inflammation of the respiratory tract, especially of the trachea and bronchioles in more advanced cases. Depression and intoxication are also conspicuous. Finally the disease is liable to acute outbursts, during which the benign character changes, and then it becomes associated with numerous septic bacteria."

Malaria: Anti-Mosquito Measures in Egypt.—The Anti-malarial Commission appointed by the Government of Egypt has recently issued its report and perhaps one of its most important recommendations is that "the Commission should sit permanently in order to exercise general control over the campaign."

The Commission begin by showing that a study and proper understanding of the rôle of the Nile is essential in the attempt to control or modify the malaria situation.

For example: through the process of silting the Nile, like other large rivers, has raised itself above the level of the surrounding country so that the land on either side becomes permeated with water under the static pressure exercised by

the river. This subsoil sheet of water rises with the flood of the river, producing pools and marshes; the fall of the river, however, is not followed by a corresponding declension in the marginal waters. The reason assigned for this is that as the river water filters up through the sandy soil of its marginal lands it carries a certain amount of detritus with it. These small particles tend to reduce the porosity of the soil and to obviate the return of the subsoil water; the return flow of surface water is also prevented by the deposition of mud under pressure whereby the pools or marshes become "puddled."

As regards *rainfall*, the Commission consider that the subsoil water derived from the rainfall is negligible as far as malaria is concerned except "in the hills or in the higher ground in the deserts in certain districts."

Some of the *oases* appear to be hotbeds of malaria and more particularly those in which the surface spring or well waters are not harnessed for use but run to waste and form ideal breeding pools. In five out of twelve inhabited areas in the El Dakhla Oasis the children have a splenic index of over seventy.

As to the *principles governing anti-malaria works* the Commission says: "Filling-in is the simplest and best solution. It is, however, obviously so expensive that it is only suitable for small sites.

Where filling-in cannot be undertaken recourse must be had to drainage. Two general methods have been tried. In the first, an attempt is made so to lower the general level of the subsoil water that it will not outcrop at any part of the area dealt with.

In the second, the subsoil water is allowed to attain its own level and is then run off from the places in which it appears into a system of drainage pipes."

Referring to *drainage of swamps* it is suggested that: "Lowering the water level in the Ismailia Canal and branches, particularly the Suez branch. Flow would then be more rapid and the growth of weeds and reeds would be reduced. There would be less seepage and also the level of the subsoil water would fall. If necessary, drains might be made parallel with the Suez branch to catch subsoil and seepage water, and divert it at intervals into the Maritime Canal."

Malaria: Prevention by Treatment.—C. C. Bass in the *American Journal of Public Health* for March, 1920, discusses the "Cure of infected persons as a factor in malaria control." He concludes:—

(1) Cure of infected persons is an important factor in control of malaria. Its usefulness depends upon the extent to which it is carried out.

(2) If the physicians would cure all the cases of malaria they treat, this alone would result in a reduction of approximately 90 per cent in the prevalence of the disease in a period of ten years.

(3) If all persons who treat themselves for malaria as well as those who are treated by physicians took proper treatment when infected, this would result in a reduction of 90·89 per cent in the prevalence of the disease in three years.

(4) By proper intensive survey and treatment it is theoretically possible to eradicate malaria entirely from any given region. A reduction of 89·9 per cent followed carrying out this method in an area of 100 square miles in Sunflower County in 1918.

Identity of Malarial Parasites.—In the *Compt. rend. de l'Académie des Sciences*, vol. 168, p. 419, 1919, Armand-Delille discusses the identity of the parasites of malignant and benign malarial fevers. The author thinks that this theory is strongly suggested because, during August to October, 1916, *Plasmodium falciparum* was found in the blood of more than ninety-five of the malaria patients examined, whereas, before August and after October, *Pl. vivax* was found almost exclusively. A similar seasonal incidence was noted by Teissoniere in 1917 and 1918. Armand-Delille thinks that possibly *P. falciparum* represents the originally infecting form of the parasite, and that *P. vivax* is a secondary form which has been modified by the formation of antibodies.

Reviews.

BACKWATERS OF LETHE. (Some anæsthetic notions.) By G. A. H. Barton, M.D. London: H. K. Lewis and Co., Ltd., 1920. Pp. vii + 151. Price 5s. net.

The author admits that the title is unconventional, and in the mind of the prospective reader "the draught of oblivion" may not be associated with anæsthetics, which is the subject of the book.

It is made up of a series of seven essays, all written in a most attractive and readable manner, and full of useful hints to those who practise this art. It is clearly the result of long experience and careful trained observation. It is rather a book for the practitioner than for the student, as considerable knowledge is assumed, yet, for the latter, its very dogmatism is a point in its favour.

"The Haven," as one essay is called, in the opinion of the author, is his own particular apparatus, and a very sound and practical one it is. He pins his faith on C.E., ethyl chloride, ether sequence and his own special apparatus. This in his hands has certainly given excellent results.

The complete mastery of a single method has much to commend it, but before condemning chloroform it must be remembered that in certain parts of the tropical world it is not possible to induce anæsthesia by ether, even by a closed method, therefore Army medical officers in any case should be well acquainted with the use of chloroform, and where inexperienced anæsthetists have often to be employed we have found the Vernon Harcourt apparatus a great safeguard.

More stress might have been laid on the importance and value of gas and oxygen anæsthesia in cases of shock. In the late war the recognition of this fact resulted in the saving of many lives. Again the author rather throws doubt on the value of warm ether or chloroform vapour, which was found a most valuable addition to anæsthetic ritual in dealing with severely wounded men. Probably it is not so universally useful in civil practice as in military surgery, but we have always gained the impression that our patients were better when warmed vapour was used.

With regard to analgesia by stovaine introduced intrathecally: while admitting that the author voices the almost universal opinion that shock is exaggerated by its use, there are many of us who used it extensively in the late war who consider that in cases where shock is likely, such as a high amputation on the thigh, it is absolutely life saving.

To get the best results it must be combined with light ether anæsthesia. If this is done and anæsthesia produced before the patient is turned into the position for the spinal puncture, shock will not follow, even in a high amputation of the thigh. It is desirable to give sufficient ether throughout the operation to keep the patient drowsy and to prevent him being present at his own operation.

In one large hospital in France where this was the invariable practice the results left nothing to be desired, and we know that after the introduction of this routine fatalities from shock practically ceased. If the advice of the author is followed to lower the head of the patient as soon as the analgesia begins to appear, severe headache is certain to follow. The other more serious sequelæ mentioned by the author may, of course, arise, but were not seen in many hundreds of the cases in which this method was used in France.

This little book is well worth perusal and raises many points of interest, not only for the anæsthetist but also for the surgeon. It is well produced and illustrated, and is free from misprints.

THE INDUSTRIAL CLINIC. Edited by Professor E. L. Collis, M.D. Pp. vii + 29, with illustrations, figures and tables. London: John Bale, Sons and Danielsson, Ltd., 1920. Price 10s. 6d. net.

The application of the principles of general hygiene to special communities proceeds apace. Military hygiene may rightly claim to be the eldest-born, and the youngest of the family—industrial hygiene—is the subject of the present volume.

Dealing with the application of the principles of health to conditions of employment, the book furnishes an interesting and valuable summary of the subject, and includes, amongst others, sections upon "The Medical Examination of the Worker," "Industrial Efficiency and Fatigue," "Hygiene of Working Conditions," and "Food at the Works."

The only fault we have to find is that an attempt has been made to produce a handbook suitable for both medical officers and welfare workers. To the medical reader, therefore, the matter in some parts will appear elementary and the treatment sketchy; but he will find in the remainder of the book many practical suggestions and an abundance of information on a subject whose close connection with industrial unrest renders it of particular importance at the present time. J. A. A.

AN ATLAS OF THE PRIMARY AND CUTANEOUS LESIONS OF ACQUIRED SYPHILIS IN THE MALE. By Charles F. White, O.B.E., M.B., and W. Herbert Brown, M.D. With a foreword by Lieutenant-General Sir T. H. J. Goodwin, K.C.B., C.M.G., D.S.O., K.H.P. London: John Bale, Sons and Danielsson, Ltd., 1920. Price 27s. 6d. net.

This is unquestionably the best aid to the diagnosis of primary syphilitic chancres and cutaneous lesions which can be obtained in any book. As indicated in the preface, it is the outcome of a study of over 19,000 cases of syphilis during the war, and those who are familiar with the appearance of syphilitic lesions will recognize that the authors have selected for illustration practically every common type of lesion met with in male practice. The book contains four colour plates and seventy-nine photographs. The first colour plate illustrates seven types of primary syphilitic sore; the second, six types of chancroid; the third, a secondary cutaneous syphilide; and the fourth, a common type of tertiary syphilide. The paintings are faithful representations, and the reader should have no difficulty in making his diagnosis by comparison of these paintings with actual lesions. The photographs are all in mezzotint, but a large proportion of them are stereoscopic, which makes up considerably for their lack of colour. The letterpress deals generally with the diagnosis of the lesions illustrated, and contains a great deal of sound advice. It includes also information on the relative frequency of various syphilitic lesions, which, on account of the huge number of cases analysed, will become classical. We repeat that this is the best work extant on the diagnosis of genital and cutaneous syphilides. If it is universally studied, as we hope it will be, there should soon be a considerable diminution in the proportion of cases which are every day being (almost criminally) misdiagnosed. L. W. H.

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FRAGMENTS.

By COLONEL SIR ROBERT FIRTH, K.B.E., C.B.

V.

THE last fragment was concerned with the misapplication of words; I would pursue the theme of words, but here confine my thoughts to matters of speech and spelling. Language undoubtedly began by being oral and a purely oral language must have been very variable, or at best little better than a jargon. When this jargon was first reduced to an alphabet, every man who could write endeavoured to express, as far as he could, the sounds he was trying to pronounce or to hear. It is a popular belief that writing was originally phonetic or meant to be phonetic; it is more than doubtful whether the belief be true. There is much to warrant the view that original writing was largely ideographic, that is the written words were symbols of meaning in no relation, or only an incomplete relation, phonetically to the spoken words. Figures for numbers are an extreme instance. The ideographic element in our language is much more common than many realize. Suppose we wished to form an adjective phonetically from the name Bacon; it certainly would not be the accepted adjective Baconian and yet this latter fulfils the purpose well. We pronounce the vowels in the noun and adjective differently, but for purposes of easy identification it is convenient that the two be similarly spelt. Then also, consonants often have an ideographic value, especially those which have become mute. Take the "k" in the word knight. It is desirable to pronounce it in cultured speech, but in writing or failing pronouncement the *k* serves as a symbol to mark the distinction between a "knightly task" and a "nightly task." Many other examples might be found, especially among words which we hear rarely pronounced but encounter frequently in print. Most of these bring home to us how largely ideographic our written language is.

The chief stumbling-block in the way of any system of phonetic spelling in our language is the plenitude of homophones. Moreover, we may fix a language phonetically, but speech will drift and, as speech drifts, writing returns to the ideographic. Radical reform in spelling seems impracticable. If phonetic spelling could be introduced it would have this advantage, it would get rid of many *quasi*-Latin and *quasi*-Greek scientific terms, but it is not practicable. The most that does seem practicable is to reform the spelling of words primarily oral, but even then we must preserve the distinctions between homophones; we might also improve pronunciation and have it taught properly in schools. The richness of our language in homophones is remarkable and constitutes one of the great difficulties for a foreigner trying to learn it, thereby emphasizing its defects as a scientific and convenient universal vehicle of speech. I can sympathize with a Frenchman trying to master the spoken word "bark," for it may have reference to a dog, a tree or a boat, while the vagaries of such words as "corse," "coarse," and "course" are impossible to explain. Homophones are clearly a nuisance and no better instanced than by such words as "ail" and "ale," "alms" and "arms," "beer" and "bier," "cede" and "seed," "done" and "dun," "gamble" and "gambol," or "serge" and "surge." Possibly we may gradually lose some of those words, simply because in speech we avoid instinctively words leading to misapprehension, but we cannot hope to make any radical changes, neither do I see why we should try to. On the contrary, I say, keep our spelling as it is, so that our descendants shall not be robbed of their literary inheritance.

The more I think over the problem the more insufferable do I find the difficulties in the way of reaching a phonetician's paradise. If "hide" means two things, it means two things, and the most we can do is to reform the teaching of pronunciation in our schools, differentiating for instance between "morn" and "mourn"; observing more carefully vowel distinctions in unaccented syllables; adopting dialectal forms to preserve words that would otherwise perish and supervising the pronunciation of new words introduced into our language. In this way, some undesirable changes can be averted and some desirable changes promoted. Word-making amongst us should be encouraged, but let us, at all cost, avoid the production and sanction of such corruptions as "garridge" and "shover," which unfortunately too often are heard among those associated with mechanical transport. Where a notion or idea has no corresponding English word, we need some authoritative literary body to authorize a word, lest worse befall, and especially so where the conceptions or the inventions of science are concerned. It is not only that great masses of our words are spelt unphonetically, full with ambiguous vowels and mute consonants, but, if phonetic spelling were to be introduced, we should have to impose not only a new spelling but new pronunciation, to say nothing of new words. I question whether we are a sufficiently logical people to tolerate any such changes.

The mention of pronunciation impels me to remark that, to my ears, one of the most lamentable signs of the time is the increasing Cocknification of the speech of educated men. Only a few evenings ago, I was horrified to hear what otherwise was an eloquent speech made by a Cabinet Minister marred by the appalling Cockney accent. The truth is there are at this day innumerable pronunciations amongst us, and it may be asked, Is each such the warrant for a distinctive spelling, phonetic or otherwise? Would Scotland or Ireland or even Somerset be entitled to a peculiar spelling by right of special manner of pronunciation? Almost every word in our language is pronounced in various ways in the British Isles and Colonies. Take the word "lord." The southern English or public school pronunciation of that word is undistinguishable from "laud," but the language of the law courts makes it "lud" and that of many provincials either "lorrd," "lowered" or "lard." Can we scrap a spelling which is phonetic in Scotland, Devonshire or Australia and substitute another? I think not, and for much the same reason as we could not scrap a spelling for words which are unphonetically pronounced by speakers of public school English. The fundamental and most current faults in colloquial English are the clipping or failing to pronounce final consonants, especially the "g," and the failure to linger on or pronounce the "r." On the other hand, an over-correction of these faults may lead respectively to pedanticism or provincialism; the difficulty is, how to acquire the happy mean.

The foregoing anomalies have largely a geographical basis, but there are others no less striking from the point of view of chronology. I myself have noted a change in methods of pronunciation in the last two decades. If in twenty years a difference is perceptible, what must it be after the lapse of a century? All pronunciations change, and in a century fashion will produce changes which are undreamt of by us. Had we phonographic records of the speeches made by such men as Canning, Castlereagh, Walpole, Bolingbroke or Pitt, it is more than probable that there would be scarcely a word to which they gave precisely the pronunciation that is now given by such men as Lord Robert Cecil, Lord Rosebery, Mr. Balfour or Mr. Asquith. The difference would be greater still, could we but hear the spoken words of the first Cecil, of Raleigh, of Leicester, of Sidney or of Shakespeare. I fancy that we should receive a shock and .magine we were listening to a company of broad, gruff and gutteral-voiced men from some hitherto unknown county of the north. To our posterity, the future holds or promises no need to make imaginings as to our spoken words. To them will pass the waxen discs of the phonograph, and from them they will know our spoken language as it was, crediting us perhaps with more nasal twang than we merit. Yet those records of our custom will be no anchor to our descendants. Just as we diverge from our fathers and our grandfathers, so will our grandchildren and those after them diverge in spoken words from ourselves. Neither rules, regulations,

precedents nor gramophone records will keep men into one set pronunciation; the English language, like some other things, is on an adventure and has been through the centuries. Take the case of a writer like Chaucer. He saw the fate which awaited his words and how they would become archaic; in these words he appealed against his doom:—

> "Ye know eke that, in form of speech is change
> Within a thousand year, and wordes tho
> That hadden price, now wonder nice and strange
> Us thinketh them; and yet they spake them so,
> And sped as well in love as men now do."

There are few things more melancholy than the spectacle of literary fossilization. A great writer, like Chaucer, lives, labours and dies. Time passes; year by year the sediment of muddy comment and criticism thickens round the great man's bones. The sediment sets firm and what was once a living organism becomes a thing of marble. And yet, though the words in which he wrote and the body of his poetry may have grown old, its spirit is still young and immortal. I have read much of Chaucer and do not hesitate to say that, not to know the spirit of his poetry is to ignore something that is of unique importance in the history of our language and our literature.

The mention of Chaucer impels me to remark that the key to a knowledge of many obscure and knotty problems of Middle English pronunciation and meaning is to be found in the dialects of our country because the modern dialects of England are not perversions of eighteenth century or even earlier speech. Their pronunciation is the development of regional Middle English dialects. I do not think that dialects are dying, all that is occurring is that their characteristics are becoming less marked. They are merely changing under the strong influences of elementary education and travel, but wherever a community is held together by ties of interest and craftsmanship there some form of local dialect will remain. I spent my early years in Hertfordshire, near the Essex border of the county, and well recall some quaint words of speech current among certain cronies of my youth. They called a path or causeway a "kaasi," a drain was a "drün," a stranger was a "thoriner." They also said "oather" for other, "ool" for will, "ood" for would, "ooman" for woman, "aers" for ears and "buoy" for boy. In spite of these eccentricities, they invariably pronounced the "h." Undoubtedly, until recently the pronunciation of English depended much more upon place of origin than upon class in society. The Tudor gentry and the sporting squires of the succeeding centuries spoke their English in quite fifty ways, and every one of them was right. Squire A. may have spoken Zumerzet but Lord Foppington said "bax" for box and "clack" for clock, while Lady Wentworth called toilette "twilette" and even Pitt pronounced point as "pwoint." If we listen to a debate in these days in the House of Commons, we cannot fail to note the variety of intonation

and pronunciation; doubtless, we should have noticed rich shades of dialect in the foregatherings of Boswell, Johnson and Goldsmith. It is difficult to deny that the approved spoken speech of the public schools and educated classes in our day is nothing but a dialect; this being so, I am forced to think that any complete uniformity or establishment of what may be called standard English has never been reached and never will be reached. This conclusion, however, in no way weakens our duty to our language and that, as we love and live with that language, it is for us to preserve the best of it as we judge best, to keep it from corruptions, to develop it along lines which we deem proper to its characters or genius, and to ensure that to those who come after us the great literature which we have inherited, and perhaps helped to create, will be an understandable thing. Better any divorce between the written and the spoken word than that Shakespeare's words should become as far and foreign as the words of early Saxon writers.

VI.

The more I mix among and read about my fellow-men, in these days, the more I feel inclined to think that lack of mental balance and mental instability are the dominant features of the aftermath of the Great War. Perhaps it is for this reason that so marked a change is noticeable in the attitude of the public towards psychology. People are beginning to realize that the subject does not consist in a useless contemplation of the workings of the human mind, but is rather a study of the mind in relation to life. From this point of view, psychology has a practical side, since all the work of the world, at least all that is deliberately planned and consciously carried out, is performed by creatures who both think and feel. The conscious mind is the one indispensable factor, and it is desirable that the average and largely ignorant person should cease to associate psychology with mesmerism or with an idle armchair philosophy, but rather begin to look upon it as the science of the mind at work in the home, the school, the play-ground, the office and the market-place. To discover the conditions of happiness and efficiency in the day's work and the day's play is indeed the ultimate aim of psychological research.

In no field of work has this change of attitude towards psychology been more manifest than in the realms of education and therapeutics. Having trifled with the subject, I am tempted to refer to some personal experiences in respect of the psychology of skill. As a man with leisure, I have found amusement in filling up idle hours by trying to acquire proficiency at such games as bowls, diabolo and golf. Though the measure of proficiency acquired has been perhaps insignificant compared with time spent, I have reached certain conclusions respecting the acquisition of motor skill which are possibly valid in other fields, not omitting that of learning. By keeping a record of daily achievements, I have noticed a

rapid rise in the curve of progress during the first few days; this is followed by a pause when the general level of the score keeps fairly constant for two or more weeks. At this stage, I seemed to have reached what may be termed a plateau. This plateau ended fairly soon and the score or measure of success again began to rise. In other words, my progress in the acquisition of skill was intermittent, improvement coming by fits and starts. Of course I credited myself with the maintenance of a constant effort to succeed. It is interesting to ask, given the effort to improve, what happens during the period of arrest? If there is no effort to succeed, the plateau which should represent a period of temporary arrest comes to represent a final arrest or the working level of efficiency. Judged by the results, practice brings no improvement, the end of the plateau is the same as the beginning; but since at the end the curve began to rise, it is evident that some kind of latent change must have been taking place all the while. From the psychological aspect, I interpret the plateau period as being one during which certain movements are mechanized or being consolidated and rendered so automatic that energy is at last set free for the next onward step. Unfortunately, the energy is not always used nor the step always taken, hence the need for constant vigilance and effort. The desire to avoid all unnecessary trouble, the proneness to rest satisfied with a passable result is a human characteristic which a study of the psychology of the situation discloses. This tendency to minimum effort is really responsible for the bulk of the mediocrity found in every calling and, doubtless, in my own case explanatory of the indifferent skill with which my efforts to excel have been rewarded. It is probable that no more effort is required to keep going on a high plateau than on a low one, but the effort comes in when we climb from one plateau to another. Rarely indeed do we do our best, for man energizes below his maximum and behaves below his optimum. In other words, the lesson of the psychology of both play and work is a scientific plea for the strenuous life.

In the field of therapeutics, psychology is much to the front both in the form of so-called hypnotic treatment, and in the guise of that tedious but apparently efficacious mode of probing the mind known as psycho-analysis. In this sphere, the psychologist is less concerned in explaining remembrance than in trying to find out how we forget. The matter has a present day interest to us owing to the prevalence of the many cases of neurasthenia and anxiety-neuroses arising out of the late war. It would appear that many of the distressing symptoms are traceable to forgetfulness. On first thought this seems peculiar, since, as a rule, forgetting is a perfectly harmless process and often both beneficent and necessary. To understand the situation, it is needful to appreciate the nature of the converse or memory. This depends on a modification of the brain cells, since every experience leaves a trace there and that trace is the basis and guarantee of its recall, which is memory or remembrance. As time passes since their last revival these traces fade gradually away, and the memories

they underlie become more difficult to recall. The deeper impressions will take longer to fade away than the fainter, but fading is the inevitable fate of them all. This may be termed normal forgetting or oblivescence. The essential feature of normal forgetting is that it is gradual and carries certain experiences gently over the line that separates the recoverable from the irrecoverable. On the other hand, the forgetfulness which is the key to the symptoms of many neurasthenics and so-called shell-shocked men is a sudden or violent pushing of the experience beyond the limit of recall.

The psycho-analyst calls this latter type of forgetting a "repression," while the resulting forgetfulness is an amnesia. An interesting question suggests itself. Is repression a normal process or is it pathological? Among some of the lower animals and among the insects there would appear to be a machinery of repression working to their biological advantage. A moth or a butterfly forgets the metamorphosis through which it has passed, and presumably a frog forgets also its fish-like habits and status which it once had. It is difficult to deny that there is no similar machinery of repression in the mind of man working on the whole for his benefit and comfort. It may be useful in the preservation of life or, on the other hand, it may be a vestige of a once useful process, but now indifferent or even harmful. If it exist at all normally in man, the machinery of repression is for one's personal comfort and to preserve peace of mind. The process is obviously to this latter purpose in the case of some neurasthenics and those who have been terrified by some experience. In them, Nature would seem to have thrown over the mind a veil or lowered a shutter which, although ultimately doing them harm, has preserved them at the time from a greater harm. The psycho-analysts carry the deduction still further and say that repression or forgetfulness of a name or experience is essentially connected with an unpleasant association therewith, though we may be unconscious of the connexion, and that if sufficient trouble be taken it can be brought to light.

Although forgetfulness of a thing or experience may exist, the basal fact remains that the association-links that bind our experiences together still exist after the experiences themselves have sunk into the unconscious. It is on this that the psycho-analyst relies in his search for that lost group of memories which he calls a "complex," and which he believes to be the source of the neural and mental disturbance. According to the modern school, the dreams supply the clue to the track that leads to the hidden complex. Certainly, when one idea recrosses the border line that separates the recoverable from the irrecoverable, it tends to pull across the border other ideas associated with it, and given sufficient time these other ideas will one by one come across. To start this crossing of the border we must, of course, begin with ideas that lie on the conscious side of the line. In this way, it is forgetting, and not remembering, that calls for inquiry and explanation. The few facts we know give abundant scope for metaphysical speculation, but in these I will not indulge, at least not now.

VII.

The collection of trifles has ever been a weakness of mine, and the limits of my purse alone have imposed limits upon the number and nature of the articles I have acquired. Even now in my senescence when wisdom should be the harvest of the years that are gone, I find a difficulty in passing the shops wherein are displayed the so-called antiques and other bric-a-brac. Each such emporium reminds me of the words of Peter Pindar:—

> "Rare are the buttons of a Roman's breeches,
> In antiquarian eyes surpassing riches:
> Rare is each crack'd, black, rotten, earthen dish,
> That held of ancient Rome the flesh and fish."

Even before the sentimental reaction of the last fifty years there seems to have been a real spirit of collecting, an admiration directed towards age and association in general, and the desire to possess things for other qualities than their surface appearance. There are several acknowledged reasons for acquiring what may be called second-hand goods: they may be beautiful—old and beautiful, foreign and beautiful, or simply old and simply foreign. The purist will admit justification only in the circumstance of beauty, but the sentimentalist will try to crowd all the categories into the simply beautiful and even try to maintain that antiquity and oddity in themselves constitute an assemblage of graces which please the eye. With others, the reason for collecting may be inferred from such lines as the following taken from "The Love of Fame," by Young, and written in 1728:—

> "How his eyes languish! how his thoughts adore
> That painted coat which Joseph never wore!
> He shows, on holidays, a sacred pin,
> That touched the ruff that touched Queen Bess's chin."

What was doubtless true then is certainly true now, and finds expression in the following doggerel of later times, the authorship of which I do not know:—

> "A clod—a piece of orange peel—
> An end of a cigar—
> Once trod on by a princely heel,
> How beautiful they are!"

For myself, I cannot plead guilty to being tempted to acquire a thing simply for so crude a reason as implied above, though I do not deny that the fact of having been associated either with a great personage of the past or some historic incident does convey an appeal and give a value. Frankly, I belong to the sentimental school and find, if not beauty, at least a genuine charm, in the chattels and odds and ends of our forefathers. Furniture has never appealed to me, though I am appreciative of its beauties and its merits. Neither can I rise to get enthusiastic over curious types of man-

traps or obsolete implements of agriculture, both of which class of article exercise a curious fascination for a friend of mine who, blessed with large storage room, has established a small museum of weird and quaint old iron. To me, such things as regimental buttons, medals, coins, seals and even tobacco stoppers have ever had an attraction. I once dabbled in keys. These, and other curiosities, ornamental or, once if not now, useful, appeal to me and doubtless to others chiefly for their age and occasionally for such qualities as mean odd as well as outlandish. It may be a form of mental aberration, but if it gives pleasure, and occasionally a financial benefit, its justification is self-evident. The essential thing to be borne in mind is, that there is a difference between initiative collecting and imitative collecting; the one is a something born, not made, the other is too often nothing more than a popular foible.

I referred, just now, to the occasional financial benefit. Of this I would say that it is the worst and most contemptible reason for procuring old things. The buyer who is satisfied that he has bought cheap that which he can soon sell dear is no collector and may be disregarded; he is but as other merchants. Of the other reason for collecting, or that which is bred of a prevailing fashion, it may be said that it starts a ball rolling which, in the course of time, grows and becomes smooth. I knew a lady in my younger days who was bitten during the 'seventies with the craze to collect blue and white china. She scoured the country far and wide in search for what she desired, not omitting unceremonious upheavals of lumber rooms among her friends. She knew absolutely nothing about china, but bought and collected simply because it was the fashion of the time to possess saucers, cups, plates and bowls of pretty blue-and-white crockery ware. After a while, it dawned upon her that some of the blue-and-white china differed from the rest and was extremely well designed, and of a fine colour. She interested herself, as a woman of leisure and means, and began to learn the meaning of what she possessed. The lesson was taught to her son and that man is one of the best connoisseurs of china and pottery ware at the present time. In the case of my old friend, gems were found amongst much rubbish, specialized knowledge was the outcome of ill-considered vanity and folly, and a veritable ball set rolling which in the next generation became both large and smooth. Of course, it is not always thus, and it is not every collector of trifles that appreciates the inner meaning and real value of what he has acquired or possesses. It is the same with any question of opinion in regard to all the arts. Terror at not seeming to like the prevalent right thing gives many occasions for foolishness and also some misery, but when the craze has a sound foundation there may arise, as in the case of my old friend, in the second generation a reasoned and honest admiration. Unfortunately, the number who buy trifles without thought of fashion, or money value, that is, buy because they truly like what they buy, is few. Of these, too often, it may be truly said they have two characteristics—sentiment and poverty. What the

materialist derides as sentimentalism is, after all, comprehended by the worst Art; but sentimental opinion is, however, rather prone to regard the poor collector as having oftener the better taste.

The chief drawback of the enthusiastic craving for collecting, which is so emphatic a characteristic of the times we live in, is that it has increased immensely the difficulty of the true collector's path. Against this there is no apparent remedy; there only remains to be patient and discriminate, fortified by the philosophy inculcated to us in our old copy-books by the well-worn tag, *disce esse parvo contentus.* For many of us now the advice is only too forcibly an advice having no alternative.

VIII.

I happen to have an extensive acquaintance amongst the prophets. At least, it seems so because so many of my friends and acquaintances are constantly telling me that the state of the country is rotten and prophesying evil days to come. Perhaps they are right, but I own to getting weary of so much pessimism. Certainly, the social, no less than the economic, sequel of the Great War presents distressing and alarming symptoms to earnest men, whose anxieties are in striking contrast with the optimism of the politicians. My prophetic friends detect a deterioration of human character which expresses itself in violence, self-indulgence, indolent reluctance to take sober thought for the morrow and cowardly shirking of responsibilities. It is a fairly heavy charge sheet and I find some difficulty in denying the accuracy of the summary of faults. My prophets divide themselves into two groups; those who have faith in specifics and those who have not.

All agree that the country is going to the dogs. The reason they give is, because democracy has disappointed those who put their trust in it. I often chaff them and ask, how could they have expected it to be otherwise? The spark of wisdom cannot be struck from the clash of the ignorance of some ten million voters, nor are disinterested ideals a likely outcome of a licensed scramble for material benefits. It is all a comedy now but may develop into a tragedy. The chief actors on the stage are false ideals, group selfishness and individual selfishness, a readiness to follow deceptive alluring lights on the part of the masses and a cunning habit of exploiting those conditions for their own profit on the part of the few. The play of this company is supposed to be under the directorship of the intellectuals, but these, in place of pointing out the way of moral and social salvation, say little that is helpful and do much that is harmful. The financing of this goodly company is in the hands of the industrial captains who, if only from a sense of self-interest, might be expected to lead if the intellectuals will not, but they are empty of ideas and incapable of any gesture of self-sacrifice. They are profiteers who show no desire to lay on the altar of the Motherland the greater part of a wealth paid for by blood and tears.

It is useless looking for a remedy to the prophets who have no faith in specifics, we must turn to those who have. And what do they recommend? The only answer I can get is, restore the domestic hearth to its former pinnacle and vitalize it with children. The theme of these prophets is categorical and amounts to this: divorce is a violation of the laws of nature as well as of the laws of God, and so are celibacy and birth control. According to this advice, if the country is to recover normal health, divorce must go, and there must be more marriages and larger families; for the family is the pillar of society and the small family but a symbol of selfishness and an unsocial thing. Moreover, as a further stage in the return to nature, mothers must nurse their own infants. It is doubtless sound and timely counsel; yet, even so, certain questions remain to be answered. Does the argument cover all the ground, and are there not, alike among the causes and among the effects of the social malady, a certain or even considerable number on which the proposed remedy could have no bearing? There are some reasons for thinking so and some relevant criticisms to be offered.

In the first place, however bad the moral condition of our people may be, it is the economic condition which threatens the most immediately disastrous consequences. We are consuming more than we produce, and that is not a state of things which can be put right by a large increase in the birth-rate. Many years will have to pass before the new consumers, now brought into the world, can become producers, and their presence in the meantime will aggravate both the milk shortage and the house shortage. In the second place, if the men and women of the present day are really as depraved as the prophets represent, it is difficult to see how we are going to improvise an earthly paradise merely by pairing them off. Two blacks do not make a white in marriage any more than in any other field of endeavour. And in the third place, as there are some two million more women than men in the land the proposed remedy is at the moment materially inapplicable, except on polygamous lines, to a vast number of cases. No, the specific fails to meet the circumstances and, at the risk of being thought cynically flippant, I am tempted to say that where we need beams of iron we are offered wisps of straw, and where we should like to hear the roaring of a lion we can perceive only the yelpings of the jackals. Excellent as is the counsel given for a rehabilitation of the home and hearth to its rightful place in our veneration, as a remedy it but touches the fringe of a complex problem. What we need is a national return to sound principles, which involve a recognition by each and all of the duty towards our neighbour as laid down in the Decalogue, a realization that prices follow the law of supply and demand, coupled with a practical appreciation of the principle that, while the labourer is ever worthy of his hire, neither man nor woman shall gain more than he or she earns. To get all this means that we and our rulers must cease to try and build on shifting sands but find a firm foundation of sound principles which include the discipline of

the moral sense, the discipline of the conscience, the development of the sense of moral obligations, and a development of the sense of individual service to the community. Of our legislative rulers would I add:—

> "By manufacture's artful hand,
> Glass, as we know, is made from sand.
> Can Alchemy's own hierophant
> Turn shifting sands to adamant?"

IX.

I write this at a period of the year when the Christian world is thinking of or preparing for what, in this country, is called yuletide. It is a season, at least in these latitudes, when Nature is in her deepest sleep; but to the thoughtful, irrespective of their orthodoxy or unorthodoxy, it is difficult to be unmoved by the psychic atmosphere which is dominant and which breathes expectancy. I well recall the days of my childhood and my youth and all that which this season conveyed of hopes and expected pleasures. It is the same to the young now, but to those of riper years and experience other thoughts crowd along. All around, one is reminded of a Coming and conscious of a call to those who may have lagged on the journey to pull themselves together and begin afresh. Once more the faithful will be guided through the solemn mysteries of the Christian revelation and have set before them ancient memories and future hopes, the beginning and the end, alpha and omega. And to those who do not count themselves among the faithful, the sounds and signs around cannot and do not pass unheeded. They may not interpret the calls precisely in the same way, nor even from the same point of view, as when they were of the household of faith, but, in spite of themselves, they cannot remain unheedful nor unaffected; old associations assert themselves and the whole social atmosphere is saturated with an emanation which bids them to disregard time, to look back to their own childhood days and yet look forward. Before and After lose their meaning, past and future are blended into one in the general rejoicing and intermingling of the old and young.

There are some who seek to make the future their own by a literal forecast; they must know times and seasons; with an intrepid mind not altogether free from a carnal curiosity, they map out the future. On the other hand, there are more who surrender frankly the future as of no concern to them; the past is theirs and the present, but a dark barrier shuts out the future. The mist lifts only a few inches at a time. It is hard to deny a significance to those words which ring out at this season and as it were beseeching the minds of men to entertain the future:—

> "Dies iræ, dies illa,
> Solvet sæclum in favilla,
> Teste David cum Sibilla."

Such words call the future into the present. We are warned that we must reckon with it now. The season which commemorates the Coming makes the past after this manner very near and homely; but even as it bridges back to the past it casts bridges across the void into the future. But this can be only if the future is treated as faith treats the past. Clearly, it must be interpreted into the values of the particular degree of faith that is within each of us. The vivid representations of this season are not meant to be more than quickening thoughts and inspirations. But, at the bottom of them, there is a suggestion if not a claim that the future unfoldings of the Christian revelation may be already ours, provided we have been able to resolve it into its spiritual values. In that proviso lies the difficulty and it rests with us to accept or reject. To me, the season and its associations compel the reflection that, have we orthodox faith or not, we cannot escape realizing in what manner of a world we dwell, what powers surround us, what surprises may come to us, and what a power is at the very door for ever waiting to enter. The privilege and the liberty remains to each of us to put our own interpretation upon the announcement, *Ecce, Dominus veniet!*

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THE PATHOGENICITY OF THE MENINGOCOCCUS.[1]

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Notwithstanding the illuminating studies by Flexner [1], Dopter [2] and others of the interaction between the meningococcus and its host, much still remains to be explained. It is now generally agreed that during an outbreak of cerebrospinal fever, for every case in which the meningococcus succeeds in setting up meningitis there is a plurality of persons in whom it does not get farther than the nasopharynx. But if as a rule the human defence is successful, there is no infection that on occasion is capable of producing death more swiftly than cerebrospinal fever. The clinical and pathological evidence adduced by Maclagan and Cooke [3] to show that in fulminating cases of this disease adrenal injury occurs, and the encouraging results obtained by them in such cases with adrenalin, suggests an explanation of the collapse of the general resistance in at any rate some of these rapidly fatal cases; and possibly when the mode of action of the meningococcus has been better defined, the breakdown of other factors in the human defence will be brought to light, and suitable treatment devised.

But apart altogether from variations in the defence, to what extent does the meningococcus itself vary in pathogenicity? and on what special attributes does its pathogenic action depend? These points are of such obvious importance that during the recent outbreak the opportunity was taken of attempting to gain a little further information concerning them. To this end, in the first place comparison was made of the virulence and toxicity respectively of a series of strains of the meningococcus for the mouse. Secondly, a search was made for evidence of the secretion of soluble toxin by the meningococcus when growing *in vitro* and also *in vivo*. Lastly, a close study was made of the meningococcus with a view to defining individual substances contained within it of importance in relation to its pathogenic action.

(A) The Effect of Various Measures on the Pathogenicity of the Meningococcus.

(a) *Pathogenicity of the same Meningococcus when alive, and when killed by Ether and by Heat respectively.*

Procedure was as follows: After sixteen to eighteen hours' incubation at 37° C. the growth on plates or slopes of trypagar was suspended in broth, and after estimating the number of cocci present by means of the turbidity test, the suspension was divided into three portions. The first of these was put at once into a water bath at 37° C. for thirty minutes. The cocci

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[1] Reprinted from Special Report Series, No. 50, of the Medical Research Council.

in the second portion were killed by adding ten per cent of ether to the suspension and shaking the tube, which was then put in the water bath at 37° C. for thirty minutes to drive off the ether. The third portion was placed in a water bath at 55° C. for thirty minutes in order to kill the cocci. After a culture had been made from each of these suspensions in order to prove that the cocci were alive in case of the first, and dead in the other two, the M.L.D. of each was determined for mice intraperitoneally in the usual manner. To exclude error, all mice that died were examined and a culture made from the heart's blood. The result of an investigation of fourteen meningococci in this way is shown in the table below.

COMPARISON OF THE VIRULENCE AND TOXICITY OF FOURTEEN MENINGOCOCCI.

Condition of coccus			Alive						Killed by ether			Killed by heat (55° C.)			Remarks
No.	Type	Strain	10,000	5,000	2,500	1,000	500	250	10,000	5,000	2,500	10,000	5,000	2,500	
1	I	Littledale	+	—	—	..	..	..	..	—	—	—	—	—	..
2	,,	Howes ..	+	+	—	..	..	..	+	—	—	—	—	—	..
3	,,	Smith ..	+	+	—	..	..	..	..	—	—	—	—	—	..
4	,,	Chalon..	—	—	—	..	..	..	+	—	—	—	—	—	..
5	,,	Jenkin ..	+	+	+	+	—	..	—	—	—	—	—	—	Recent
6	II	Foster ..	—	—	—	..	..	..	+	—	—	—	—	—	..
7	,,	Cleaver..	+	—	—	..	..	..	—	—	—	—	—	—	..
8	,,	Morgan	—	+	—	..	..	..	—	—	—	—	—	—	..
9	,,	Brook ..	+	+	—	..	..	..	+	—	—	+	—	—	Recent
10	,,	Pugh ..	+	+	+	+	+	—	—	—	—	—	—	—	Recent
11	III	Chase ..	+	—	—	..	..	..	—	+	—	—	—	—	..
12	,,	Groom ..	+	—	—	..	..	..	—	—	—	—	—	—	Recent
13	,,	Howes ..	+	—	—	..	..	..	+	—	—	+	—	—	..
14	IV	Jones ..	+	—	—	..	..	..	+	—	—	+	—	—	..

Note.—The figures at the tops of the columns indicate the approximate number of million cocci injected.

+ = death of mouse. — = recovery.

Meningococci 5, 9, 10, and 12 were all injected within a few days of isolation from severe cases. The remainder had been in stock for several months before injection.

This table brings out the following points :—

(1) That in the majority of these meningococci the pathogenicity for the mouse was reduced when the coccus was killed either by ether or by heat.

(2) That in several instances heating appeared to reduce the pathogenicity rather more than etherization.

(3) That the difference between the pathogenicity of the coccus alive and dead, i.e., between its virulence and toxicity, was far less in case of the older cocci than in some, though not in all, of the most recently isolated ones.

(4) That the reduction of pathogenicity produced either by ether or heat was most marked in case of the two most virulent cocci of the series (Nos. 5 and 10), both of which had been isolated recently from fulminating cases of cerebrospinal fever.

(b) The Effect on its Pathogenicity of suspending the living Meningococcus in Broth and in Distilled Water respectively.

Procedure was as follows: Two meningococci of known virulence were each cultivated for eighteen hours at 37° C. on a pair of trypagar slopes of equal size. Next morning all four slopes were completely covered with growth. One slope of each meningococcus was then suspended in broth and the other in distilled water. A turbidity test indicated that in the case of each coccus the density of the suspension in broth and in water respectively was approximately the same. A portion of the broth suspension of each coccus was now killed by adding ten per cent of ether. After all of the suspensions had stood at 37° C. for thirty minutes, the pathogenicity of each was determined on mice. The results were as follows:—

Type	Strain	Coccus in broth			Coccus killed by ether			Coccus in water		
		0·1	0·05	0·025	0·1	0·05	0·025	0·1	0·05	0·025
I	Smith	+	–	–	–	–	–	–	–	–
II	Pugh	+	–	–	–	–	–	–	–	–

Note.—The doses refer to fractions of a slope culture.

+ = death of mouse. — = survival.

It would appear that etherization of the broth culture and suspension of the coccus in water are alike unfavourable to its pathogenicity. In the present experiment cultures made from the suspensions in water at the time of injection showed some growth, though less than similar cultures from the suspensions in broth. From some observations on the vitality of the meningococcus in various menstrua made later it would appear that the probable explanation of the lower pathogenicity of the water suspensions in this experiment was that the mortality rate of the suspended cocci was higher in the water than in the broth.

c) The Effect on its Pathogenicity of killing the Meningococcus by Desiccation.

In order to determine the effect of drying the meningococcus, broth suspensions were made in the usual manner from young cultures of four meningococci on trypagar, and a series of falling doses of each measured out in duplicate in 0·5 cubic centimetre amounts in watch-glasses. In the case of each coccus the contents of one set of watch-glasses were now injected into mice. The duplicate doses in the remaining watch-glasses then each received a drop of ether to prevent growth of contaminations, and were placed in a desiccator which was exhausted of air and placed for one night at 37° C. Next morning the dry deposits were each suspended

in 0·5 cubic centimetre of distilled water and after a drop had been cultivated, injected into mice. The cultures remained sterile. The results on the mice were as follows:—

(1) Type I, strain Chalon. Pathogenicity, alive, 5,000 million positive, 2,500 million negative. Toxicity, dried, 20,000 million negative.

(2) Type II, strain Morgan. Pathogenicity, alive, 5,000 million positive, 2,500 million negative. Toxicity, dried, 5,000 million positive, 2,500 million negative. In view of this unusual result, the experiment was repeated, but the result was the same.

(3) Type II, strain Caruna. This coccus had been recently isolated from a very severe case that died in a few days. The pathogenicity of the coccus when alive was 500 million positive, 250 million negative. The toxicity of this same coccus when dried was 4,000 million positive, 2,000 million negative.

(4) Type II, strain Sister. This coccus has also been isolated from a recent case in which the patient recovered. The pathogenicity alive was 2,000 million positive, 1,000 million negative. When dried, a dose of 4,000 million was negative.

In the case of three of these four meningococci, therefore, desiccation of the coccus reduced its pathogenicity very materially. This was especially well marked in the case of No. 3, the most virulent of the four cocci.

(*d*) *The Effect of Age on the Pathogenicity of the Meningococcus.*

The particular meningococcus (Lindenbaum) used in this experiment had recently been isolated from a specimen of cerebrospinal fluid which was kindly given to me by Colonel Flexner when in this country. The case from which it came succumbed rapidly, and the coccus, which was swarming in the cerebrospinal fluid and in pure culture there, proved to be a specimen of Type II. Six equal-sized slopes of trypagar were inoculated from an early subculture of it and placed at 55° C. After one day the growth on two of the slopes was suspended in broth, thoroughly mixed, and divided into two portions, one of which was then heated for half an hour to 55° C. After a culture had been made from each portion, the pathogenicity for the mouse was determined of the coccus when alive, and when killed by exposure to 55° C. With the remaining slopes the test was repeated after they had been in the incubator for three and six days. As regards vitality, it was found that the suspensions before being heated at 55° C. gave profuse growth when the coccus was one day old; and about half as much growth when it was three days old; but no growth when it was six days old. In all of the heated suspensions the coccus was dead. The result of the pathogenicity tests was as follows. (See table on next page.)

The outcome of this experiment is instructive. Corresponding with its vitality, the pathogenicity of the unheated coccus was high on the first day

when $\frac{1}{40}$ of a slope proved fatal. It had decreased by seventy-five per cent on the third day, and by fifty per cent further on the sixth. In case of the heated coccus the zone of pathogenicity was not reached either on the first or third day, but on the sixth its pathogenicity had apparently increased and was now equal to that of the unheated coccus. As by the sixth day on the trypagar slope the coccus had died, its pathogenicity for the mouse was no longer affected by heating it to 55° C. for thirty minutes. From experiments to be described later it seems probable that the increase in toxicity shown by the heated coccus on the sixth day as compared with the result on the first and third day was due to liberation of its endotoxin by autolysis.

Condition of meningococcus	Dose (fraction of slope)	Age of meningococcus		
		1 day	3 days	6 days
Unheated	0·2	+	+	+
	0·1	+	+	—
	0·05	+	—	—
	0·025	+	—	—
Heated to 55° C. ..	0·2	—	—	+
	0·1	—	—	—
	0·05	—	—	—
	0·025	—	—	—

+ = mouse died. — = mouse survived.

(*e*) *Conclusion.*

The preceding observations indicate that the most pathogenic examples of the meningococcus for the mouse are to be found in certain specimens of it recently isolated from severe or fulminating cases of cerebrospinal fever. The major portion of the pathogenicity of these very virulent meningococci is labile, and would appear to be closely associated with the ability of the coccus to multiply actively in the tissues of its host; since mice succumbing to these virulent cocci invariably gave a profuse growth of the coccus from their blood.

On the other hand, even when dead the meningococcus still possesses considerable pathogenic power; and this toxicity would seem to be of a more stable character. The result of further study of this endotoxin of the meningococcus will be described later.

(B) Search for Evidence of the Secretion of a Soluble Toxin by the Meningococcus.

From the observations just described it would appear that the major portion of the pathogenicity of certain recently isolated meningococci for the mouse depends upon a factor that is thermolabile, etherlabile, and that

disappears from a culture on trypagar in the course of a few days as the coccus dies. One explanation is that the factor in question consists of the capacity of the coccus to multiply. But clearly this cannot be the whole explanation because of the very great difference between the pathogenicity for the mouse of various meningococci equally able to multiply *in vitro*, to judge by their profuse growth on trypagar. The question therefore arises: Is the pathogenicity of these virulent meningococci due to their ability to secrete a toxin?

Provided that such a toxin exists, it may conceivably be either intracellular or extracellular. It is necessary, therefore, in the first place to see if any evidence can be found of the secretion of an extracellular toxin by the meningococcus.

(a) *Search for Extracellular Toxin in Cultures in vitro.*

On a number of occasions cultures of virulent strains of the meningococcus were made in fluid media consisting of broth enriched by ascites fluid, serum, or rabbits' blood. After incubation for periods varying from a few days to as many weeks the cocci were separated off by centrifuge or by filter and the pathogenicity of the fluid tested by injecting amounts up to 0·5 cubic centimetre of it into mice intraperitoneally. In no case was any certain evidence obtained of the presence of soluble toxin in the medium. On the other hand the centrifugal deposit containing the separated cocci when tested in the same way gave distinct evidence of pathogenicity. Such toxin therefore as was demonstrable was retained within the bodies of the cocci.

(b) *Search for Extracellular Toxin in Cultures in vivo.*

It seemed possible that the failure to find toxin in cultures *in vitro* might be due to unsuitability of the medium. It was decided, therefore, to repeat the test in the animal body, and to see if any evidence could be obtained of the secretion of an extracellular toxin by the meningococcus in the peritoneal cavity of the guinea-pig.

The same meningococcus (Lindenbaum) was used in this experiment as had been employed in the test in which the effect of age on the pathogenicity of the meningococcus was determined. Two guinea-pigs were selected, each of which weighed approximately 400 grammes. The approximate M.L.D. for a guinea-pig of this size of the coccus here employed was found to be about 50,000 million cocci. One of the guinea-pigs received intraperitoneally 2·5 cubic centimetres of Type II anti-meningococcus serum, and one hour later both pigs received a dose consisting of 400,000 million living cocci intraperitoneally. The next day both guinea-pigs had succumbed.

Guinea-pig No. 1.—This animal had received no serum. It showed a large number of minute subcutaneous hæmorrhages giving these tissues

a "sooty" appearance. The peritoneal exudate contained much blood, and a film of it showed microscopically swarms of meningococci and fairly numerous red blood corpuscles, but no white corpuscles. About ten cubic centimetres of the exudate was collected without difficulty and centrifuged hard until it was quite clear; the red blood corpuscles then forming a layer 0·5 cubic millimetre thick at the foot of the tube. The absence of free hæmoglobin in the clear fluid showed that in spite of the escape of blood into the peritoneal cavity little or no hæmolysis had occurred there; 0·5, 0·2, and 0·1 cubic centimetre of this clear fluid was cultivated on trypagar slopes and similar amounts of it were injected intraperitoneally into mice. The cultures all grew the meningococcus mixed with *Streptococcus fæcalis*. The mice were slightly ill for one day, but had quite recovered in forty-eight hours.

Guinea-pig No. 2 had received intraperitoneally 2·5 cubic centimetres of Type II antimeningococcus serum one hour before injection of the coccus. The subcutaneous tissues showed no visible changes. The peritoneal exudate was straw coloured with a few flakes of fibrin and leucocytes; it contained no blood. About ten cubic centimetres of the exudate was collected. The film of this showed microscopically comparatively few particles of any kind. Here and there were a few shadows of cocci, and some polymorphonuclear cells. The fluid was centrifuged hard for three hours and then cultures were made from 0·5, 0·2, and 0·1 cubic centimetre of it, and similar quantities were injected into mice. The meningococcus grew in all these cultures in pure culture. The mouse that had received the largest dose was ill next day but had recovered in forty-eight hours: the other mice were unaffected.

No convincing evidence, therefore, was obtained of the presence of free toxin in the peritoneal fluid of either of these animals. As it seemed possible, however, that such toxin might have been present and perhaps have been fixed by the tissues during the interval that elapsed between the death of the animal and the post-mortem examination, the experiment was repeated and the peritoneal exudate removed for examination before the animal had succumbed to the injection.

Guinea-pig No. 3.—This animal, which weighed 390 grammes, received intraperitoneally 400,000 million living meningococci at 9 a.m. and five hours later it was killed by ether and the peritoneal exudate collected. The exudate was turbid and showed a few red blood cells. A film of it revealed swarms of meningococci, but nothing else. Cultures showed that living meningococci were present in this exudate to over 1,000, but less than 10,000 per cubic centimetre, while the blood of the animal showed over 100 but less than 1,000 living meningococci per cubic centimetre. The following tests were made with the exudate: 0·1, 0·01, and 0·001 cubic centimetre of it were injected intraperitoneally into mice with the result that the mouse injected with 0·1 cubic centimetre died in three days, the others recovered. The rest of the exudate was centrifuged

hard and 0·5, 0·2, and 0·1 cubic centimetre of the supernatant fluid injected into the peritoneal cavities of mice which, however, failed to develop any illness.

So far as they went, therefore, these experiments failed to show any certain evidence of free toxin capable of affecting mice in the peritoneal fluid of the guinea-pig in which the meningococcus was present in living condition and in large numbers. It is not justifiable, of course, on this evidence to deny the possible presence of free toxin there for the guinea-pig, and it is regrettable that a dearth of young guinea-pigs prevented the toxicity of the exudate being tested on animals of the homologous species. But while it is not claimed that these observations established the absence of free toxin, they certainly failed to provide any certain evidence of its presence.

There remains the possibility that the high virulence of certain recently isolated meningococci may be due to their possessing an intracellular labile toxin; or it is conceivable that they may possess an actively autolytic tendency that renders their endotoxin more soluble in body fluids than is the case with less virulent cocci. Flexner has emphasized the importance of this autolytic tendency of the coccus in setting free its endotoxin *in vivo*, and it is possible that some factor at present undefined inhibited its demonstration in the experiments described above.

INTRACELLULAR CONSTITUENTS OF THE MENINGOCOCCUS OF PATHOGENIC IMPORTANCE.

The preceding investigations having failed to provide any sure evidence of the presence of soluble toxin in the fluid surrounding the meningococcus when growing either *in vitro* or *in vivo*, an attempt was made to identify intracellular constituents of this micro-organism of importance from the point of view of its pathogenic action. So far as this investigation has progressed, three components of the meningococcus of pathogenic interest have been identified and studied, namely, a hæmolytic substance, a reducing agent, and a powerful endotoxin. The information which has been obtained with regard to each of these intracellular constituents of the meningococcus respectively will now be described.

(A) Studies of an Intracellular Hæmolytic Substance contained by the Meningococcus.

During the recent outbreak of cerebrospinal fever among the military forces a special endeavour was made to define the particular qualities that determine the potency of antimeningococcus serum. In the course of this inquiry it became necessary to ascertain the ability of individual specimens of serum to neutralize the endotoxin of the meningococcus. In order to obtain endotoxin for this purpose trial was made of the method

introduced by Besredka [4] and used successfully by himself and others for extracting endotoxin when determining the anti-endotoxic capacity of various antibacterial sera. Although Besredka's method does not appear to have been applied previously to the meningococcus, it has been found with a few minor modifications to be of value also for the purpose of preparing the endotoxin of the micro-organism. Procedure is as follows: A recently isolated meningococcus of known serological type and of good virulence for the mouse intraperitoneally is sown on fifty or more plates of trypagar. After eighteen hours' incubation at 37° C. the growth is removed from these plates by suspending it in saline, and this suspension after microscopical examination is then centrifuged hard for two hours or more until the cocci are deposited. The bulk of the supernatant saline is then thrown away and the deposited cocci transferred to a glass dish; a few drops of ether are added as a preservative, and the dish placed over sulphuric acid in a desiccator which is then closed, exhausted of air, and placed at 37° C. The dried deposit on the plate next morning is scraped off, powdered, and examined microscopically: it consists entirely of the dead and dried bodies of meningococci. The M.L.D. of this powder for the mouse intraperitoneally has been found to average from two to four milligrammes, the degree of toxicity depending apparently on the extent to which the toxin within the bodies of the cocci can be got into solution before injecting it. From some careful weighing experiments kindly carried out for me by Corporal J. W. Hughes, B.Sc., R.A.M.C., it has been estimated that one milligramme of the dried meningococcus represents the bodies of about seven thousand million raw meningococci.

On triturating this powder by pounding it in an agate mortar, at the same time slowly adding distilled water, and by then making some hæmolytic tests with this material it was found that the meningococcus contains a substance possessed of lytic properties for the red blood-cells of man, and of the rabbit, guinea-pig, and mouse. In a paper published in the *British Medical Journal* of January 26, 1918, mention was made of the fact that the dried bodies of meningococci of all four serological types are hæmolytic; and that this property was not lost on heating them for thirty minutes to 60° C.

As this hæmolytic substance appeared to be retained within the body of the meningococcus as tenaciously as is the endotoxin, but unlike the latter the lytic substance is readily demonstrable *in vitro*, it has been investigated at some length with a view to ascertaining the conditions under which it is liberated from the interior of the coccus, and its general properties. Not only was there reason to suspect that the former might possibly be a guide to the conditions under which the endotoxin also is set free, but an equally important point demanding investigation at that time was the question as to whether the hæmolysing agent is or is not identical with the intracellular toxin of the meningococcus. In order to make the inquiry complete an investigation was made in the first place

of the hæmolysing powers of the living meningococcus when growing in culture.

(*a*) *Hæmolytic Action of the Meningococcus when growing in Culture.*

Experiment 1.—Blood was drawn aseptically from the finger and transferred to the condensation fluid of a dozen trypager slopes which were then inoculated with the meningococcus and incubated at 37° C. Although profuse growth occurred in all of the tubes none of them showed any evidence of hæmolysis until between the fourth and seventh day. Blood placed in the condensation fluid of a control uninoculated tube kept with these others did not hæmolyse until the tenth day. In some confirmatory experiments made later with other batches of medium hæmolysis occurred somewhat earlier, beginning on the second or third day.

Experiment 2.—Four of the most actively lytic meningococci in the first experiment were each sown on to two slopes, and blood was placed in the condensation fluid of one, but not into that of the other. All of the tubes were incubated at 37° C. and when after the lapse of several days hæmolysis was evident in the tubes containing blood, fresh blood was introduced into the condensation fluid of the duplicate tubes which were then returned to the incubator. Well-marked hæmolysis was produced in all in a night. This experiment was repeated on two further occasions with a similar result.

The inference drawn from these observations was that when the meningococcus is growing on trypagar slopes at 37° C. the hæmolytic substance contained within it is retained until after two or more days, when it is liberated whether blood is present or not. The accuracy of this inference was now tested by comparing the hæmolytic power of a suspension of the same meningococcus after it had been grown for one day and seven days respectively on trypagar.

Technique.—The method employed in the following hæmolytic tests was as follows: Small test tubes, three inches long and ½ an inch broad, were used. These were sterilized, plugged with wool, and were arranged in metal racks fitting into a water bath kept at 37° C. The procedure followed was to add 0·1 cubic centimetre of a five per cent suspension of washed human red blood-cells to 0·5 cubic centimetre amounts of alling dilutions of a suspension of meningococcus made by suspending the growth of a slope or plate in 0·85 per cent saline, a control of the corpuscles and saline alone being always used as well. After exposure for two hours in a water bath at 37° C. the racks holding the tubes were taken out, allowed to stand on the laboratory bench, and read off next morning. In comparing the hæmolytic power of various meningococci, the procedure used in many of the later experiments was to suspend the whole of the surface growth of an eighteen hours' slope culture in one cubic centimetre of saline after removing the condensation fluid. Taking the average

number of meningococci present in such a suspension as 20,000 million, dilutions were prepared from it containing 10,000 million, 5,000 million, 1,000 million, etc., in 0·5 cubic centimetre. When working with plate cultures the average total growth of a completely covered trypagar plate has been taken as 200,000 million cocci, and dilutions made in a similar manner as in the case of slopes. By proceeding in this way a uniform method was arrived at of testing the hæmolytic power of a meningococcus. Precisely the same procedure was employed later when investigating the reducing power of the meningococcus.

It is advisable to carry out all of these tests as aseptically as possible. Unless this is done errors are apt to creep in, particularly from the action of the skin staphylococcus—a hardy micro-organism that grows readily in saline suspensions of the meningococcus, and has a well-marked hæmolytic action. For this reason, it is always advisable to scrutinize very carefully with Gram's stain any suspension of meningococci that have been kept for more than a day; unless of course the suspensions have been heated, or some suitable antiseptic added.

(b) *Influence of Age on the Hæmolytic Power of the Meningococcus.*

Seven meningococci were subcultured on to trypagar slopes and a comparison made of the hæmolytic power of each after incubation for one day and seven days respectively at 37° C. The growth of each culture was suspended in 1 cubic centimetre of saline and a series of dilutions made of 0·5 cubic centimetre of this suspension through four successive 0·5 cubic centimetre amounts of saline. The hæmolytic power of these suspensions was then tested on washed corpuscles in the manner described. The result was as follows. When one day old all seven meningococci failed to produce any hæmolysis in a dose of $\frac{1}{8}$ of a slope representing approximately 2,500 million cocci, and $\frac{1}{4}$ of a slope only produced a trace of hæmolysis. When seven days old, on the other hand, the hæmolytic effect was well marked in case of all the cocci even in $\frac{1}{32}$ of a slope, representing approximately 625 million cocci. Hæmolytic power therefore was over four times as strong in all the cocci on the seventh day as on the first. Subcultures showed that all the cocci were alive on the first day, and dead on the seventh. Clearly then, although dead, the meningococcus is far more hæmolytic in a seven-days-old culture on trypagar than in a young actively growing culture on this medium.

(c) *Diffusibility of the Hæmolytic Substance.*

Three ten-weeks-old cultures of the meningococcus in broth, and in the same medium enriched by serum and blood respectively, were now examined in order to see if the hæmolytic agent could be detected in the fluid of the culture. The cultures were centrifuged until clear and the hæmolytic power of the fluid compared with that of the deposit. No hæmolytic action was seen in case of the fluid when diluted 1 : 10 of saline; but the deposit containing bodies of meningococci produced

definite hæmolysis in all three cases in a dilution of 1 : 10, and in two of them up to a dilution of 1 : 40. The hæmolytic substance, therefore, had not become diffused through the medium, but was bound up with the bodies of the cocci.

(*d*) *Effect of Autolysis in setting free the Hæmolytic Subtance.*

The principle adopted was to employ the young coccus and to determine the influence of autolysis upon its hæmolytic activity.

Effect of the Autolysin.—It seemed probable that the autolytic enzyme which Flexner showed to be such an important factor in the physiology of the meningococcus would have an important influence on the liberation of the hæmolytic substance. As the autolysin is greatly diminished by heating the coccus to 65° C. for thirty minutes, a fresh saline suspension of the raw coccus was divided into three parts. One of these portions was left alone, the other two heated for half an hour to 55° and 65° C. respectively. The three suspensions were then kept for ten days at 37° C., after which their hæmolytic power was compared. It was found that the unheated coccus gave best results; then the coccus heated to 55° C., and lastly the coccus heated to 65° C. The autolysin therefore appears to have a distinct influence in liberating the hæmolytic substance.

Effect of Various Factors on Autolysis for Setting Free the Hæmolytic Substance.—(1) As a preservative for the suspensions of the meningococcus toluol was found to be far superior to phenol. (2) As regards macerating fluids saline appeared to be better than either water or broth. (3) In a comparison of dry *v.* wet autolysis (i.e., autolysis on a trypagar slope as compared with autolysis in saline) the values were about equal—perhaps slightly in favour of the dry autolysis.

(*e*) *Effect of Heat on the Hæmolytic Substance.*

In the first place an actively hæmolytic suspension of the meningococcus was prepared by suspending in saline the growth from some plate cultures of it that had stood in the incubator for a week. The effect on the hæmolytic activity of this suspension was then determined of heating it for thirty minutes to 55° C., 65° C., and 100° C. respectively. So far from reducing the hæmolytic power, the heating appeared to improve it, hæmolysis being best in the suspension heated to 100° C. The investigation was continued, using a suspension of the coccus when one day old, two days, and three days respectively; and heating each of them to 100° C. and to 120° C. for thirty minutes. The result of this experiment proved very instructive. The raw coccus when one day old failed to hæmolyse, but after being heated to 100° C. the same suspension was found to possess a distinctly hæmolytic action which was increased by heating it to 120° C. In case of the coccus when two and three days old hæmolysis was active before the coccus was heated; but in both cases the hæmolytic power was increased by heating; the suspension heated to 120° C. being the best.

The effect was now determined of heating a suspension of the one-day-old coccus to 120° C. in the autoclave for one hour, two hours, and three hours respectively. The hæmolytic power of the suspension before and after being heated was as follows:—

Material	Number of million cocci				
	10,000	5,000	2,500	1,250	625
Meningococcus 1 day old, unheated	+	(+)	–	–	–
,, after heating to 120° C. for 1 hour	+	+	+	(+)	–
,, ,, ,, ,, 2 hours	+	+	+	+	–
,, ,, ,, ,, 3 ,,	+	+	+	+	(+)

+ = well-marked hæmolysis. (+) = slight hæmolysis.

It is clear from the above results that the longer the coccus was autoclaved, the more its hæmolytic substance was liberated. It may be mentioned that after being autoclaved at 120° C., the suspension of the young coccus became more transparent, and though microscopically the outlines of the cocci were still visible, it appeared that the meningococci had undergone partial dissolution. This is the probable explanation of the direct relation between the length of exposure in the autoclave and the hæmolytic power of the suspension.

(*f*) *Effect of Desiccation on the Hæmolytic Substance.*

Since the hæmolytic substance is present in the dried coccus, it was plain that it withstands desiccation. An experiment, however, was made in order to see what loss, if any, occurs during the process. A saline suspension containing 20,000 million two-days-old meningococci per cubic centimetre was divided into three portions. The first of these was heated to 55° C. for thirty minutes and then remained at room temperature over night. The second portion was dried *in vacuo* at 37° over night and then resuspended in the same amount of distilled water. The third portion was autoclaved at 120° C. for thirty minutes, and then divided into two parts, one of which was allowed to stand at room temperature over night, the other was dried *in vacuo* at 37° C. over night and resuspended in the same amount of distilled water next day. The hæmolytic power of these four suspensions was as follows:—

No.	Material	Number of million cocci					
		10,000	5,000	2,500	1,250	625	312
1	Coccus heated to 55° C. ..	+	+	+	(+)	–	–
2	,, dried and unsuspended	+	+	+	+	(+)	–
3	,, autoclaved	+	+	+	+	(+)	–
4	,, dried and unsuspended	+	+	+	+	(+)	–

Desiccation, therefore, so far from impairing the hæmolytic substance, rendered its hæmolytic power more prominent in case of the coccus heated to 55° C., while it failed to make any difference in the autoclaved coccus. The probable explanation of the increase in case of No. 2 above is that the dried coccus was partially broken up when resuspending it.

(g) *Effect of Solvents on the Hæmolytic Substance.*

The next step was to determine the value of each of five solvents, namely, distilled water, saline, absolute alcohol, acetone, and ether respectively for extracting this hæmolytic substance from the meningococcus. Trials have been made of each of these solvents on the meningococcus when one day old and when six days old respectively. In both series also the effect was determined of autoclaving the coccus for two hours at 120° C. before submitting it to extraction.

The procedure followed was to make a thick suspension of the coccus from trypagar plates. For this purpose five cubic centimetres of distilled water was used to the plate, giving an average density of approximately 40,000 million cocci per cubic centimetre. This suspension was next divided into five equal portions of two cubic centimetres. The first portion was left alone, being used for a control. To the second 5 cubic centimetres of water was added, to the third 5 cubic centimetres of saline, and to the others 5 cubic centimetres of alcohol, acetone, and ether respectively. After thorough admixture, the saline and water were cleared of cocci by centrifuge. In the case of the alcohol, acetone, and ether extracts, the mixture was boiled for a few minutes in a water bath and then allowed to stand for half an hour in cold water, by which time the cocci had settled to the bottom. The fluids were now removed by pipette and evaporated to dryness in watch-glasses. Next day the deposits on the watch-glasses were each dissolved in one cubic centimetre of saline, and the hæmolytic power of the solution tested in the ordinary way. Controls done in the same way with the evaporated residue of five cubic centimetres of each of the solvents alone proved quite negative.

Effects of Solvents on the Meningococcus when One Day Old.—It was found that none of the five solvents had any value for extracting the hæmolytic substance from the one-day-old coccus when unheated; but when this same suspension had been autoclaved for one hour at 120° C. the acetone and the alcohol both succeeded in extracting the hæmolytic substance, the acetone being the more successful of the two. Water, saline, and ether all failed to extract the hæmolytic substance even when the suspension had been autoclaved. It was noticed that whereas the alcoholic extract of the coccus before it had been autoclaved was quite clear, the similar extract of the coccus after it had been autoclaved was distinctly turbid from the presence therein of the hæmolytic substance.

Effect of Solvents on the Meningococcus when Six Days Old.—In this

case both acetone and alcohol extracted the hæmolytic substance before the coccus was autoclaved, although more of the hæmolytic substance was taken up by both solvents from the same suspension after it had been autoclaved for one hour at 120° C.

The hæmolytic substance contained by the meningococcus, therefore, is soluble in acetone and in absolute alcohol, and when thus extracted and the solvent evaporated off it can readily be redissolved in saline. Autoclaving the coccus at 120° C. before extracting it considerably increases the amount of hæmolytic substance taken up by either acetone or alcohol. In ether, on the other hand, the hæmolytic substance would appear to be insoluble; even the autoclaved coccus giving negative results with this method.

Summary.—The meningococcus contains a hæmolytic substance which is hidden within the young actively growing coccus, but becomes active as the coccus ages. The autolysin of the meningococcus appears to have an influence in "unlocking" this hæmolytic substance as the coccus becomes older; but though more active in the older cocci, the hæmolytic substance appears to remain attached to their bodies.

The intracellular hæmolytic substance of the meningococcus is very resistant to heat, and this property can be applied to demonstrate its presence in a suspension of young meningococci by the simple expedient of autoclaving the suspension at a temperature of 120° C.; by which treatment the cocci are partially disintegrated and the hæmolytic substance unmasked.

This hæmolytic substance is unaffected by desiccation. It is soluble in acetone and alcohol, but not in ether. When the hæmolytic substance is extracted from the meningococcus by acetone or alcohol, and these solvents are evaporated off, it is readily soluble in water or in saline.

(B) Studies of an Intracellular Reducing Agent contained by the Meningococcus.

While carrying out the hæmolytic experiments described in the preceding section it was noticed that when washed red blood corpuscles are added to a suspension of living meningococci, and the mixture placed in a water-bath at 37° C., the bright scarlet tint of the corpuscles rapidly becomes changed to a dark purple colour. As it seemed possible that this change of colour was due to a reducing action on the part of the living meningococcus, the experiment was repeated, using methylene blue as an indicator in place of the red corpuscles. The methylene blue quickly became bleached by the coccus, the true colour returning temporarily on shaking the tubes well so as to aerate them. Clearly then the living coccus exerts a strong reducing action on its immediate environment, and since this property of the meningococcus appears to have escaped attention hitherto, and was of considerable interest in its possible relation to the pathogenic action of the micro-organism, it has been investigated at some length.

Method.—The procedure followed when studying the reducing action of the meningococcus was similar to that employed when investigating the hæmolytic power of this micro-organism. Once again, the condensation fluid of a slope culture of the coccus on trypagar having been removed, the whole of the growth was suspended in the diluent; and taking the average number of cocci contained by such a suspension as 20,000 million, falling dilutions were made as before, each bulking to 0·5 cubic centimetre. The same small tubes plugged with wool and held by racks fitting into the water-bath at 37° C. were used in both investigations. When in some of the experiments red blood corpuscles were used as an indicator, 0·1 cubic centimetre of a 5 per cent suspension of washed human red blood corpuscles was added to each of the tubes containing falling amounts of the suspension of the coccus. In the majority of the experiments, however, methylene blue was used as indicator because of its convenience. For this purpose a stock solution was made up of 1 : 1,000 methylene blue in distilled water, and for each test a 1 : 10 dilution was made up from the stock bottle; and 0·1 cubic centimetre of this dilution added to each of the tubes containing 0·5 cubic centimetre dilutions of the suspension of the coccus. The concentration of methylene blue in each test therefore was 1 : 60,000. After adding the indicator, the tubes were well shaken to distribute it, and the racks holding them placed in a water-bath at 37° C. Unless stated otherwise, the time of exposure was two hours at 37° C., although as a rule the main features of the result are clearly visible within thirty minutes.

(*a*) *Comparison of Red Blood Corpuscles and Methylene Blue as Indicators of the Reducing Action of the Meningococcus.*

Two trypagar slope cultures were made of each of three meningococci, and after eighteen hours' incubation at 37° C. the growth of the pair of cultures of each coccus was suspended in saline, mixed, and falling dilutions made therefrom in duplicate series. Washed red blood corpuscles were then added to one set of dilutions of each coccus, and methylene blue to the other. The results were as follows :—

Type	Strain	Indicator	Approx. No. of million cocci present				
			10,000	5,000	2,500	1,250	652
I	Littledale ..	Corpuscles ..	+	+	+	+	+
,,	,, ..	M. Blue ..	+	+	+	−	−
I	Smith ..	Corpuscles ..	+	+	+	+	+
,,	,, ..	M. Blue ..	+	+	+	+	−
II	Cleaver ..	Corpuscles ..	+	+	+	+	−
,,	,, ..	M. Blue ..	+	+	+	−	−

+ = reduction produced.

Although in case of all three cocci the red blood corpuscles proved the more delicate index, methylene blue was adopted for routine purposes because of its greater convenience.

(*b*) *Effect of Menstruum on the Reducing Power of the Meningococcus.*

Some preliminary experiments having indicated that the reducing power of the meningococcus is more active when it is suspended in broth than in either saline or distilled water, an experiment (see p. 380, experiment (*b*)) was made in order to compare specimens of meningococci of all four serological types in this respect.

The reducing action, therefore, of all four meningococci was more intense in broth than in saline or distilled water.

In a further experiment the reducing power of the first of the preceding meningococci (Smith) was compared in water, saline, broth, serum (horse) and in two samples of cerebrospinal fluid, one of which was a specimen of normal cerebrospinal fluid, while the other came from a case of streptococcal meningitis. Before use both cerebrospinal fluids were freed of suspended matter by centrifuge. Six eighteen hours equal-sized slope cultures were made of the meningococcus, and the growth on each slope was then suspended in one of the fluids referred to and a set of falling dilutions made in 0·5 cubic centimetre amount. The reduction effected by the coccus in each menstruum is seen in the following table:—

Dilutions of a One-day Slope Culture of Meningococcus.

Menstruum	1/5	1/10	1/25	1/50	1/100	1/200	1/400
Water	–	–	–	–	–	–	–
Saline	+	–	–	–	–	–	–
Broth	+	+	+	+	–	–	–
Serum	+	+	+	+	+	–	–
C.S. fluid (1) ..	+	+	+	+	–	–	–
C.S. fluid (2) ..	+	+	+	+	–	–	–

+ = reduction of M. blue.

The reducing power of the coccus, therefore, was best in serum, then in broth, and in both specimens of cerebrospinal fluid. As before, both saline and water were unfavourable. The explanation will appear later (cf. (*g*) below).

(*c*) *Is the Reducing Agent soluble in the Menstruum or confined to the body of the Meningococcus?*

Several experiments were made in which the living meningococcus fresh from an eighteen hours' slope was suspended in saline or broth, and then a portion of the suspension was centrifuged till clear, and the fluid separated off from the deposited cocci and tested for reducing power. Although in

all these tests the suspension before being centrifuged, and also the cocci deposited from it, reduced methylene blue, no reduction was effected by the fluid washing of the cocci. In an apparent exception where the fluid of a broth suspension produced some slight reduction after being centrifuged, it was found on examination to still contain living meningococci.

Some experiments were now carried out in which rich suspensions were made of two specimens of the meningococcus in water, saline and broth respectively, and after being kept for ten days at 37° C. the cocci were deposited by centrifuge, and the reducing power of the fluid and deposited cocci tested separately. Although the deposits produced some reduction, all the fluids were negative. Up to the present, therefore, no certain evidence has been obtained of the secretion of a soluble reducing agent by the meningococcus in cultures. It would seem, then, that the reducing property is mainly confined to the surface and interior of the coccus. The question now arises: Is this intracellular reducing agent a function solely of the living protoplasm of the coccus, or does it continue when the coccus is dead?

(*d*) *Effect of Heat on the Reducing Power of the Meningococcus.*

(i) *Result of Heating the Meningococcus to* 55° *C. for thirty minutes.* Numerous experiments having proved that the meningococcus is killed by exposing it for half an hour to 55° C., the effect of such exposure on the reducing power of the coccus was determined.

Two meningococci were employed in this test and the experiment was carried out in duplicate, using washed red blood corpuscles as indicator in the first series, and methylene blue in the second. The menstruum used was broth.

The results were as follows:—

Type	Strain	Condition	Indicator	Approximate number of million cocci					
				10,000	5,000	2,500	1,250	625	Vitality
I	Littledale..	Unheated ..	R.B.C.	+	+	+	+	+	+
I	,, ..	Heated to 55° C.	,,	+	+	+	–	–	–
II	Cleaver ..	Unheated ..	,,	+	+	+	+	–	+
II	,, ..	Heated to 55° C.	,,	+	+	–	–	–	–
I	Littledale..	Unheated ..	M. blue	+	+	+	–	–	+
I	,, ..	Heated to 55° C.	,,	+	+	+	–	–	–
II	Cleaver ..	Unheated ..	,,	+	+	+	–	–	+
II	,, ..	Heated to 55° C.	,,	+	+	(+)	–	–	–

It is clear that although the exposure to 55° C. killed the coccus in all cases, it failed to abolish the reducing action. The more sensitive red corpuscles also detected a diminution in the reducing power consequent on the heating that the coarser methylene blue failed to reveal.

(ii) *Effect of heating the Meningococcus to* 60° *C. and* 70° *C. respectively for thirty minutes and for one hour.* Meningococci representative of all

EXPERIMENT (*b*).

Type :	I				II				III				IV			
Strain .	Smith				Morgan				Chase				Jones			
Millions of cocci :	2,500	1,250	625	312	2,500	1,250	625	312	2,500	1,250	625	312	2,500	1,250	625	312
Water	+	+	–	–	+	+	–	–	+	+	+	–	+	+	(+)	–
Saline	+	+	–	–	+	+	–	–	+	+	(+)	–	+	+	(+)	–
Broth..	+	+	+	–	+	+	+	–	+	+	+	+	+	+	+	+

+ = reduction of methylene blue.

EXPERIMENT (*e*).

Character :	Reduction								Hæmolysis							
Age of coccus :	1 day				8 days				1 day				8 days			
Dose (millions) :	5,000	2,500	1,250	625	5,000	2,500	1,250	625	5,000	2,500	1,250	625	5,000	2,500	1,250	625
Type I. Smith	+	+	+	+	–	–	–	–	(+)	–	–	–	+	+	+	+
,, I. Howes	+	+	+	+	–	–	–	–	–	–	–	–	+	+	+	(+)
,, I. Jenkin	+	+	+	+	–	–	–	–	–	–	–	–	+	+	+	+
,, II. Morgan ..	+	+	+	+	–	–	–	–	(+)	–	–	–	+	+	+	+
,, II. Pugh	+	+	+	+	–	–	–	–	–	–	–	–	+	+	+	(+)
,, III. Chase	+	+	+	+	–	–	–	–	–	–	–	–	+	+	+	+
,, IV. Jones	+	+	+	–	–	–	–	–	(+)	–	–	–	+	+	+	+

four types were now submitted to the above temperatures for the times stated. In all cases cultures proved that the cocci were killed by the heating. The indicator used was methylene blue. It was found that a temperature of 60° C. for thirty minutes had but little effect on the reducing activity of the cocci; and even one hour at this temperature, while it diminished the reducing power of the weaker cocci, had but small effect on the more actively reducing ones: 65° C. for thirty minutes was not much if at all more effective, but in one hour produced considerable diminution; 70° C. for thirty minutes produced very marked diminution, and in one hour abolished the reducing power of five out of the six cocci tested, and almost abolished it in the exception which still showed a trace of reduction in a concentration of 5,000 million after being heated.

Inference.—The reducing agent contained by the meningococcus survives temperatures between 55° and 65° C. that are fatal to the coccus, and is therefore independent of its living protoplasm. This reducing agent, however, is destroyed by exposing the coccus for one hour to 70° C.

At 100° C. the reducing power of the meningococcus is destroyed at once.

(e) *Effect of Age on the Reducing Power of the Meningococcus.*

(i) *Comparison between Meningococci aged one day and eight days respectively.*—An investigation was made at the same time of the reducing and hæmolytic powers of seven meningococci after one day and eight days' growth on trypagar respectively. Red blood corpuscles were used as the indicator of both characters. The medium used was saline. The results were as shown on p. 380, Experiment (e).

The effect of age on the reducing power of the meningococcus is the exact opposite, therefore, to the effect on its hæmolytic power. The young living culture reduces, but does not lyse; whereas the older dead culture lyses, but does not reduce.

Type	Strain	Temperature of growth	Age	Vitality	Reducing power			
				(5,000)	5,000	2,500	1,250	625
I	Smith ..	37° C.	1 day ..	+	+	+	+	(+)
I	,, ..	,,	2 days ..	—	+	(+)	—	—
I	Howes ..	,,	2 ,, ..	+	+	+	(+)	—
I	,, ..	,,	3 ,, ..	—	+	(+)	—	—
II	Pugh ..	,,	2 ,, ..	+	+	+	+	+
II	,, ..	,,	2 ,, ..	—	+	+	(+)	—
II	,, ..	,,	4 ,, ..	—	(+)	(+)	—	—

(ii) *Comparison of the Vitality and Reducing Power of Meningococci between the first and fifth day.*—An investigation was now made of cultures of meningococci of one to four days' growth on trypagar in order to

determine at the same time their vitality and reducing power. To complete the series, some of the cocci after remaining at 37° C. for a day were then kept at room temperature and examined in the same way. The results of these observations were as follows :—

In case of all three cocci the reducing power of the coccus survived its failure to grow in subculture. The results thus confirmed those of the heating experiments. The reducing power, however, did not outlast the death of the coccus for more than a few days.

(*f*) *Effect of Desiccation on the Reducing Power of the Meningococcus.*

This was examined in the same way as when investigating the effect of desiccation on the hæmolytic power of the meningococcus. It was found that whereas desiccation has no effect on the hæmolytic substance, it completely abolishes the reducing action.

(*g*) *Effect of Menstruum on the Vitality of the Meningococcus.*

When investigating the pathogenicity of the meningococcus it was observed that this micro-organism is more virulent when suspended in broth than when suspended in saline or water; and the same has been found to hold with regard to the reducing power of the meningococcus (cf. (*e*) above). The opportunity was now taken of determining the vitality of the coccus when suspended in each of these fluids respectively.

Procedure was as follows: Three equal-sized slope cultures of Type II meningococcus strain Morgan of one day's growth at 37° C. were each suspended in five cubic centimetres of distilled water, saline and broth respectively; 0·5 cubic centimetre of this suspension was then diluted with 4·5 cubic centimetres of the same diluent, and from this a further dilution made in the same way. Thus 0·5 cubic centimetre of the suspensions represented $\frac{1}{10}$ of the slope culture, and the same amount of the dilutions $\frac{1}{100}$ and $\frac{1}{1000}$ of the slope. The test tubes holding the suspensions and dilutions of the coccus in each of the three fluids were placed in a water bath at 37° C., and cultures made from 0·5 cubic centimetre of each of the nine tubes at the start, and after one hour and two hours. The result was as follows :—

Menstruum	Time	Fractions of slope culture		
		1/10	1/100	1/1,000
Water	Start	+	+	−
,, ...	1 hour	+	(+)	−
,, ...	2 hours	+	−	−
Saline	Start	+	+	+
,, ...	1 hour	+	(+)	−
,, ...	2 hours	+	−	−
Broth	Start	+	+	+
,, ...	1 hour	+	+	+
,, ...	2 hours	+	+	+

+ = growth of meningococcus. (+) = slight growth only. − = no growth.

The meningococcus, therefore, perishes more rapidly in water and saline than in broth, and this is the probable explanation of the loss of virulence and of reducing power by the coccus when suspended in saline or water.

(*h*) *Effect of Antiseptics on the Vitality and Reducing Power of the Meningococcus respectively.*

The method used was as follows:—

Principle: 0·1 cubic centimetre volumes containing falling amounts of the disinfectant are brought in contact with 0·4 cubic centimetre volumes of a freshly made suspension of the meningococcus in broth containing 10,000 million cocci per cubic centimetre; i.e., with 4,000 million cocci. The test is carried out in small test tubes held in racks in a water bath.

Dilution of Disinfectant.—As the disinfectant is diluted 1 : 5 by the coccus suspension, the concentration of disinfectant to add is $\frac{1}{5}$ of the concentration selected for trial. A simple table may be compiled showing how to prepare such amounts rapidly in 0·1 cubic centimetre bulk for testing disinfectants at concentrations between 1 : 10 and 1 : 10,000.

Suspension of the Coccus.—A suspension of the meningococcus approximately of the density required can be obtained by suspending a plate culture of it in twenty cubic centimetres of broth, or a slope culture in 2·5 cubic centimetres of broth.

Time and Temperature of Exposure.—Thirty minutes in a water bath at 37° C.

Method of Culture.—Two large loopfuls of the suspension are transferred to a warm trypagar slope which is placed in the incubator directly it has been inoculated.

The result given by three different disinfectants, namely, mercury bichloride, zinc sulphate, and chloramine T, when tested on two different strains of Type I meningococcus by this method are shown in the following table on next page.

It is seen that there is a rough correspondence between the vitality of the coccus and its possession of reducing power; and also between destruction of the coccus by the disinfectant, and its loss of reducing power. Although this correspondence is not always exact—zinc sulphate, for instance, had more effect on the reducing power than on the vitality of the Howes coccus—it would seem probable from these observations that by determining the smallest amount of disinfectant required to inhibit the reducing power of the meningococcus, some idea can be obtained as to the region of the "end-point" of the bactericidal power of the disinfectant for this same micro-organism. Should this relation be substantiated by further experiments, a preliminary examination of the effect of a given disinfectant on the reducing power of the micro-organism—a test easily effected within half an hour or so—may be found to save much time, labour, and material when defining the value of various disinfectants. These remarks apply, of

course, to disinfectants that fail to reduce *per se* in a concentration near their bactericidal end-point.

Disinfectant	Concentration	Howes coccus		Smith coccus	
		Vitality	Reduction	Vitality	Reduction
Mercury bichloride ..	1 : 10,000	–	(+)	–	–
	1 : 25,000	–	+	–	–
	1 : 50,000	(+)	+	–	–
	1 : 100,000	+	+	+	+
Zinc sulphate	1 : 100	–	–	–	–
	1 : 200	+	–	–	–
	1 : 300	+	+	+	+
	1 : 400	+	+	+	+
	1 : 500	+	+	+	+
Chloramine T... ..	1 : 500	–	–	–	–
	1 : 1,000	(+)	+	+	–
	1 : 1,500	+	+	+	+
Contol	Broth	+	+	+	+

+ = growth or reduction. (+) = slight growth or reduction.

In addition to the disinfectants mentioned, trial has been made of the effect of other substances such as alcohol, acetone, and ether, also of toluol and phenol. All of these both destroyed the coccus and abolished its reducing power; but the end-points have not yet been worked out so carefully as in the case of mercury bichloride, zinc sulphate, and chloramine T.

Summary.—The reducing agent whereby the living meningococcus when suspended in a suitable medium exercises a strong reducing action on its immediate environment is chiefly confined to the body of the coccus; in other words to its surface and interior. This reducing agent survives the death of the coccus brought about by exposing it for thirty minutes to 55° C., but is destroyed by an hour's exposure to 70° C., and practically at once at 100°C. Similarly the reducing agent survives death of the coccus by attenuation. Though not entirely dependent on the vitality of the coccus, the reducing agent does not survive it for long; and the comparatively feeble reducing power of the coccus in water or saline as compared with its power in broth, cerebrospinal fluid, or serum, is associated with the speedy death of the coccus in the former fluids. Again, while the end-points of the three disinfectants tested on the meningococcus corresponded roughly with the concentration at which the reducing power of the coccus was abolished by them, this correspondence was not always exact. Desiccation destroys alike the vitality of the coccus and its intracellular reducing agent.

Conclusion.—The inference drawn from these observations is that the reducing action of the living meningococcus is brought about by an intracellular reducing enzyme or "reductase" contained by this micro-organism.

Note with regard to the Literature of Bacterial Reductase.—Reference to the literature shows that the reducing action of bacteria has been known for many years past, and that this reducing capacity is very widely spread among bacteria. There is a difference of opinion as to the manner in which it is brought about; some holding that it is produced by the vital activity of the bacterial cytoplasm, others that it is due to an enzyme secreted by the cell and capable of extending for some distance beyond the actual cell wall. Spina and Rothenberger first showed that the reducing agent was thermolabile, the reaction being destroyed by heating the culture to 60-70° C. Cathcart and Hahn's observations support the view that the reaction is due to an enzyme. In favour of this is the unfavourable influence of low temperatures (0° C.), the optimum results being obtained at 40° C., and an impairment of the reducing agent produced by heating the cultures to 55-60° C. Führmann (*Vorlesungen über Bakterienenzyme*, Jena, 1907, p. 110), to whose monograph I am indebted for the above information, concludes that the balance of the evidence is in favour of the reaction being due to an enzyme which he calls reductase. It will be observed that the experiments related in the present report led to a similar conclusion with regard to the reducing capacity of the meningococcus.

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(*To be continued.*)

SOME LABORATORY WORK IN CONNEXION WITH THE AFGHAN WAR, 1919.

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A Base Laboratory was formed in Rawalpindi on the outbreak of the Afghan War, in order to deal with invalids from the frontier, who were collected in the five General Hospitals established round Rawalpindi. Being situated a little over 100 miles from the scene of operations, these hospitals received cases usually early in the course of the disease, so that ample opportunities for pathological work were found in these hospitals, and in the Base Laboratory, which acted as a Central Laboratory for the smaller laboratories of the General Hospitals.

The work was necessarily entirely of a routine nature, but one considered that a description of the nature of laboratory work in connection with frontier operations might be of some general interest. As the campaign occurred during the hot weather, the work concerned mainly hot weather diseases; cholera, dysentery and enteric taking up most of one's time. Malaria did not become prevalent until the onset of the rains.

With regard to cholera first, about 700 "clearing tests" were carried out for cholera convalescents from the frontier, in order to make sure primarily that the large number of them collected in Rawalpindi should not start an epidemic in the station. They all had had three negative tests before arrival, but when a case occurred among one of their attendants, extra tests were considered advisable. Out of 700 tests, three were found positive. The method adopted was as follows:—

Immediately the stool was passed, it was brought to the laboratory of the hospital, and a small portion emulsified in peptone water and placed in the incubator. Fifty specimens daily were thus prepared, and after six hours' incubation were collected at the Base Laboratory for examination.

A loopful from the surface of the culture was examined microscopically, and any culture showing organisms resembling the cholera vibrio was plated out on peptone agar plates after dilution in normal saline. By diluting thus, discrete colonies were obtained, and those characteristic of cholera were grown on agar slopes, and tested with high titre serum. Cholera-like organisms were frequently found, but in only three was the organism proved to be true cholera.

The special cholera media were tried, but with indifferent success as it was found that several batches of plates of Dieudonné's medium and Aronsen's medium failed to grow a culture of true cholera.

Of local acute cases in Rawalpindi, twenty-five were proved to be suffering from true cholera, i.e., the vibrio was isolated and proved in each

case. An interesting point was noticed during examination of a contact of one of these cases, who developed symptoms of cholera, even to cramps and collapse. Several attempts to find the cholera vibrio proved negative. Slight fever developed, and an examination was made for bacillary dysentery which also was negative. Examination of a blood film showed it to be loaded with malignant tertian parasites. Quinine was administered and the stools rapidly became normal. Two other contacts of the same case developed choleraic symptoms. Direct examination of the stools microscopically on several occasions failed to show the cholera vibrio. A piece of mucus from each case was however grown in broth, and then plated on plain agar, and typical cholera colonies were found, which were subsequently proved to be those of true cholera.

The most satisfactory method of examination of acute cases of cholera was found to be as follows:—

First examine a smear of the mucus, stained with dilute carbolfuchsin, and, if possible, give a provisional diagnosis at once in order to allow of the immediate adoption of precautionary measures.

Secondly take a small piece of the mucus in a platinum loop and plant it in broth or peptone water, and incubate for a few hours. Then having diluted a two-millimetre loopful from the surface of the culture in about five cubic centimetres sterile saline, plate out the dilution on peptone agar and incubate over night. Next morning a definite diagnosis can be made by testing the discrete colonies thus obtained with high titre serum. It was noticed that many of the colonies afterwards proved to be true cholera were not as generally described, small and conical, but were of a flattened irregularly spreading character, absolutely clear and transparent, and often about two millimetres in diameter. These agglutinated at once on the slide when tested with high titre serum and they were always searched for first.

Dysentery.

A large number of microscopical examinations of fæces for *Entamœba histolytica* and other protozoa was carried out, 704 specimens of fæces being examined during the period under review. They were mostly made for the detection of *E. histolytica* and as a routine method two preparations were made for each specimen: an emulsion in normal saline for examination for free amœbæ and an emulsion in iodine solution (double Gram) for the detection of cystic forms. Later on, vital staining of the living amœba was carried out by emulsifying the fæces in a warm solution of neutral red, one per cent in saline. Remarkably good results were obtained with this method of treatment. The amœbæ are rendered strikingly distinct, and are very easily picked out from the surrounding structures on the slide. The endoplasm is stained bright red, the nucleus is rendered distinct, while the structureless hyaline character of the ectoplasm, with perhaps several red blood corpuscles engulfed by it, is clearly seen. The amœbæ will live

for half an hour in the stain and continue to throw out pseudopodia although the movements are less active than in saline. Gradually the movements cease altogether, and the ectoplasm collects itself all round the endoplasm, and the amœba appears as a dark, red staining mass, which cannot be identified.

One is inclined to believe that the best routine method for the examination of dysentery stools is to make two emulsions, one in warm neutral red saline for immediate examination for living protozoa, and the other in double Gram for cysts. One has seen it stated that if a much weaker solution of neutral red 1 in 10,000 is used, it will serve to distinguish *E. histolytica* from *E. coli*, as *E. coli* does not take up the stain, but from the small experience of about a dozen cases in which the weaker solution was used it appears that *E. histolytica* will not take up such a weak stain. As no *E. coli* were seen when using the stronger stain, an opinion as to the value of the neutral red method for differentiating purposes cannot be given. It has no differentiating value in the examination of cysts, were this necessary, as *E. coli* cysts readily absorb the stain.

No amœbæ were diagnosed histolytica unless at least one active amœba was found containing red blood corpuscles. The size was found to vary from fourteen to twenty-five microns.

Histolytica cysts varied from eight to fourteen microns, and in one case in which a small amœba was found the cysts also were of a small type.

It was observed that size was not of much value in diagnosis, except in eliminating the undifferentiated cysts of the type, Bodo, etc. The commonest variety of *E. histolytica* cysts were those with one or two nuclei and the classical eight nuclei cysts of *E. coli* were also commonly found.

A double infection of amœbic and bacillary dysentery occurred in one case. The patient developed an acute attack of dysentery and the stool was plated. Microscopical examination showed *E. histolytica* cysts, and from the plate *Bacillus dysenteriæ* Flexner was isolated. This case was probably one of acute bacillary dysentery occurring in a carrier of *E. histolytica*.

A large number of negative findings was reported, but as samples were sent from almost every case of diarrhœa by enthusiastic Medical Officers, this is not surprising.

A remarkable fact which one cannot explain is that the number of flagellates found declined rapidly as the cold weather came on, but the number of diarrhœa cases declined more slowly. It appeared as if many of the diarrhœa cases in the rains were due to flagellates, and that those in the cold weather had some other cause. Several specimens were found so loaded with flagellates that the diagnosis of flagellate diarrhœa could not be withheld. In these cases some fields showed nothing but a seething mass of flagellates. The samples were of a yellowish frothy character containing mucus, but no blood.

The following is a table of protozoological findings for the period under report :—

E. histolytica		*E. coli*		Lamblia		Tricho-monas	Tetra-mitus	*E. nana* cysts	Cerco-monas	Flagellate cysts
Vegetative forms	Cysts	Vegetative forms	Cysts	Vegetative forms	Cysts					
61	85	14	30	17	41	42	32	11	13	

Dysentery bacilli were very seldom met with. A total of 148 stools was plated, Conradi's medium being employed. In many of them evidence of amœbic dysentery was subsequently discovered, and in very few was the sample received early enough in the disease to render the finding of a dysenteric organism likely. The organism was isolated in five cases, all local infections, from which a specimen was obtained on the first or second day of the disease.

Enteric Group.

For the detection of enteric bacilli, Conradi's medium was employed, in spite of a difficulty in obtaining satisfactory litmus. Likely colonies were picked off and tested against a combined T.A.B. high titre serum and these showing no agglutination on the slide were discarded. This method, however, was given up during the cold weather, as it was found that agglutination on the slide was often very tardy in its appearance, and that some colonies, proved afterwards to belong to the enteric group, did not agglutinate on the slide at all. This was obviated in the cold weather by putting likely colonies into a mannite fermentation tube, and then, if positive through the sugars, the agglutination test being used only as a confirmatory test.

Difficulty was experienced in the hot weather with litmus, as apparently it deteriorated very rapidly, no matter from what source obtained ; so much so that in order to obtain a reliable result in the sugar tests, the addition of litmus to the sugar was given up altogether. Organisms were inoculated into " white " sugars and the litmus added after two or three days' incubation. This gave quite satisfactory results.

Two hundred and sixty-one Widal tests were done, each against *Bacillus typhosus, paratyphosus* A and *paratyphosus* B. One was often asked by medical officers new to India and tropical disease, to state whether a result was positive or negative, and one came to the conclusion that unless the Medical Officer realizes the very numerous limitations of this test when applied to the inoculated soldier, the result of the test is apt to be very misleading. For example, Serjt.-Major W., transferred from the frontier as a case of enteric group, was admitted to hospital in Rawalpindi about the nineteenth day of disease, and his blood was sent for Widal test. The result was that agglutination with *B. typhosus* was present in a dilution of

1 in 250. Clinically he seemed a case of enteric group, with continued fever and enlarged spleen. During a differential count of his blood, parasites of malignant malaria were found. The administration of quinine resulted first in his temperature assuming for nearly a week the characters of a malarial chart, and then in becoming normal.

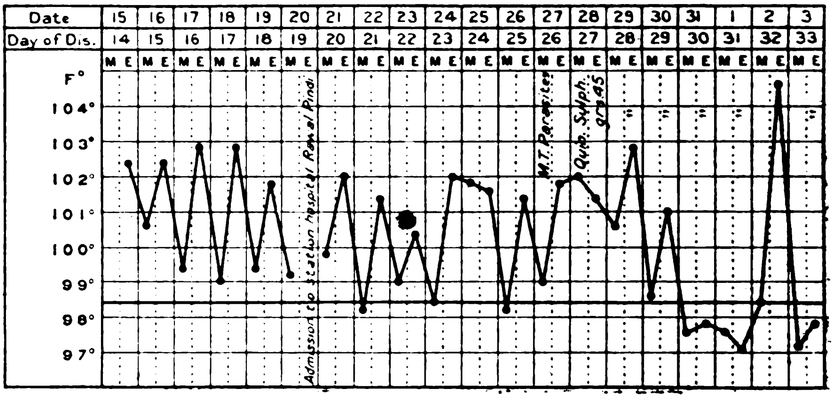

CHART 1.

It cannot be too strongly emphasized that the Widal test is nowadays of little value in the Army, owing to universal inoculation, unless one is prepared to go into the results of a series of tests taken at about four-day intervals. The official method in India of interpretation of the Widal test is to judge a series of tests, and from the fact of rising agglutination to one or other organism of the enteric group, to state that the result is positive to a disease of the enteric group. If one wishes to place the disease in one or other category of the enteric group by means of this test alone, which is for several good reasons not allowed so far as official diagnosis is concerned, then it is necessary that these tests be done, not only during the fever, but for a period extending for a fortnight or so into convalescence. The fact that a series of three or four Widals, done during the fever, shows a rising or a falling amount of agglutination to one of the organisms of the typhoid group, is not definite proof that the patient is suffering from disease produced by that particular organism. It may mean one of three possibilities :—

(1) That the patient is suffering from disease produced by that organism.

(2) That he is suffering from some totally distinct febrile condition and that the rising agglutination is caused merely by the infection.

(3) That he is suffering from a disease of the enteric group, but not that due to the organism which produces the rising agglutination. It is now common knowledge that the agglutinins of paratyphoid A often may not begin to increase until the apyrexial period is reached, so that were Widal tests carried out only during the fever, the rising agglutination to para A would be missed altogether. Many cases have occurred in this laboratory

in which rising agglutination to *B. typhosus* was found, and one was tempted to suggest to medical officers that *B. typhosus* was the cause of the fever. Tests carried on into convalescence, however, in several cases showed a much more marked rise to *B. paratyphosus* A, showing that in all probability this organism was the cause of the fever. It is regretted that time did not permit of carrying out series of Widal tests on all cases from which an organism of the group was isolated in order to prove this point. This, however, has been done by many other workers. All that could be aimed at, owing to pressure of work, was to give medical officers as much aid to diagnosis as time and opportunity permitted.

Although it is possible to differentiate the diseases of the group by a study of the agglutination curve, it is certain that it requires a number of tests spread over a long period, and much experience in the interpretation of the results of these tests.

There are many difficulties even in the way of using the test as an aid to the diagnosis of enteric group, apart from attempting to diagnose a particular disease of the group by means of it. The possibilities of being misled by a high titre of agglutination in an inoculated man are so great that it is questionable if the test as ordinarily applied is of much value. As long as one realizes that without a series of tests, and without a definite rising agglutination in this series, the test is of little value and should not be attempted, then one can use it safely as an aid to diagnosis, but one often finds that the samples sent for examination are too few in number for each case and are not sent at intervals which are best from a diagnostic point of view. I would suggest that the interpretation of a Widal test be left to the clinical bacteriologist, who can observe the cases on whom he does the test. When sending out his results, he should state his opinion as to their value or otherwise as an aid to diagnosis, and also suggest dates as to when further specimens would be of value.

The following cases which occurred in this laboratory are instances in which the test was of value as an aid to the diagnosis of enteric group, the figures given representing the highest dilution in each test with which agglutination was obtained.

	First Widal			Second Widal			Third Widal			Fourth Widal		
	T	A.	B.	T.	A.	B.	T.	A.	B.	T.	A.	B.
Pte. D.	125	250	—	250	250	—	500	250	—	800	250	—
Pte. F. ..	125	25	—	500	25	—	800	25	—	—	—	—
Serjt. H. ..	500	—	—	800	—	—	1,000	—	—	—	—	—
Pte. S. ..	100	—	—	250	—	—	500	—	—	—	—	—
Miss G.	125	125	—	250	250	—	125	500	—	—	—	—
Gnr. F. ..	125	50	—	50	125	—	25	500	—	25	2,000	—

The following are instances in which it was of no value whatever, and might even have been misleading.

	First Widal			Second Widal			Third Widal			Fourth Widal			Diagnosis
	T.	A.	B.	T.	A.	B.	T.	A.	B.	T.	A.	B.	
S. M. W. ..	250	—	—	125	—	—	—	—	—	—	—	—	Malaria
Pte. U. ..	—	—	—	—	—	—	—	—	—	—	—	—	Typhoid fever, *B. typhosus* found in blood
Capt. R.	—	—	—	25	50	—	—	—	—	—	—	—	Enteric group, clinically
Gnr. G. ..	—	—	—	—	—	—	—	50	—	—	—	—	,, ,,
Serjt. R. ..	—	—	—	—	—	—	—	—	—	—	—	—	,, ,,
Lieut. G. ..	—	125	—	—	—	—	—	—	—	—	—	—	Malaria

In all cases Dreyer's method of performing the test was carried out. All tests were done, on an average, at about weekly intervals.

As a routine from August onwards all bloods for Widal test were put up against a strain of *B. coli*, isolated from a case of bacilluria in the Lahore Medical College. Many cases of obscure fever were occurring in the hospitals which, although clinically enteric, yet yielded no evidence whatever of enteric group infection when examined by ordinary laboratory methods. It was thought that these might be cases of *B. coli* infection, and therefore Widal tests were done against a strain of the organism which had been used for the same purpose in Lahore. It is difficult to state in this case what amount of agglutination might be looked upon as a positive result, but it was thought that anything over 1 in 20 should be regarded as pointing to a positive result. Out of about 150 tests only ten showed an agglutination of over 1 in 20 with *B. coli*. Of these two were subsequently diagnosed malaria, as a result of blood examination—one as clinically malaria, one as broncho-pneumonia; one died of liver abscess (his serum agglutinated on three occasions up to 1 in 250), while the sixth yielded *B. paratyphosus* A from the blood. Of the four remaining, three were diagnosed enteric group on a series of Widals. The figures, of course, are too small to be of value.

Malaria.

During the frontier operations, May to December, 1919, 2,152 specimens were examined for malaria in this laboratory alone. Of these 581 were positive. Benign tertian malaria predominated, the figures being 425, against 155 for malignant tertian. Until the middle of May malaria was practically absent in Rawalpindi, as shown by positive figures in the laboratory. Then commenced an inrush of cases from the frontier, most of

them benign in nature, with only an occasional case of malignant malaria. The malignant malaria commenced in the second week of September as the rains began to diminish, and the pools which remained were left undisturbed (by further rain) for longer periods. These cases were mostly local in origin. They reached their highest in the third week of October, and continued at a lower level until the end of the year, at which time their numbers equalled those of the benign tertian cases, both, however, being small. In November the malignant tertian cases greatly exceeded benign tertian—thirty-nine positive findings being malignant tertian and twenty-five benign tertian in that month. This is shown in the attached

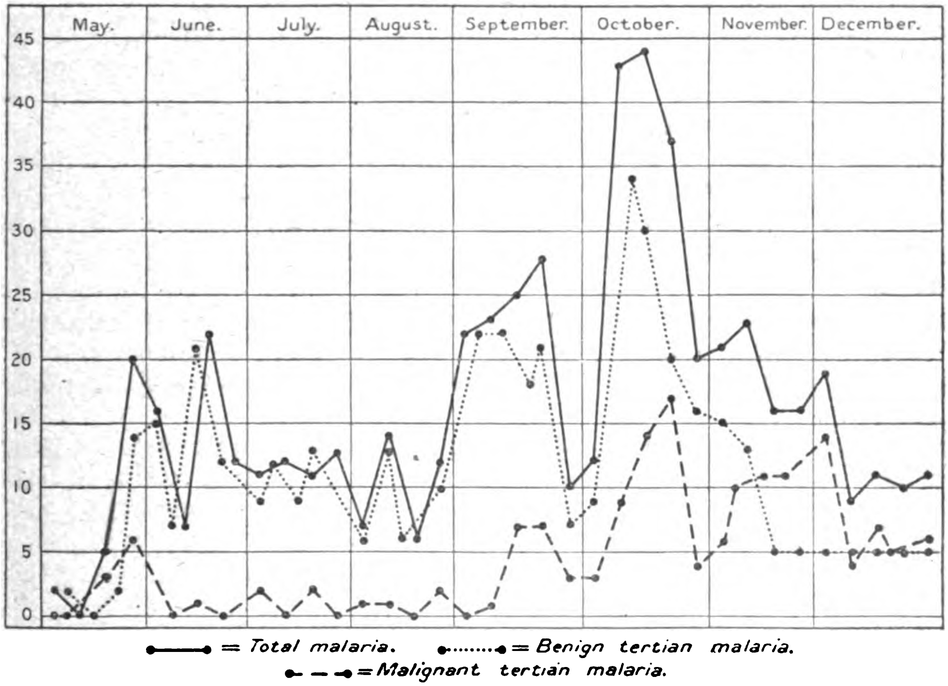

CHART 2.

Chart showing the number of positive examinations per week for malaria in the Base Laboratory, Rawalpindi. Figures before May are not shown, as they were practically nil.

chart in graphic form. The highest point of the benign tertian cases was reached in the first week of October, i.e., a fortnight earlier than the malignant tertian cases, from which time they steadily and rapidly declined, in this way differing from the malignant tertian cases. The persistence of the malignant tertian cases at a high level at the end of the year was probably due to the greater difficulty in the treatment of malignant malaria and to their more frequent relapse rather than to a large number of fresh infections.

The thick-drop method, stained by Leishman's stain, was used in all cases, a smear also being examined in doubtful cases.

Quartan malaria was not met with during the year.

MISCELLANEOUS.

An interesting case may be mentioned under this heading. A patient was sent from No. 14 Indian General Hospital to have a vaccine prepared from sores on his skin. These sores covered the whole of the face and most of the body, and had the appearance of crusted warts. No history of syphilis could be obtained and no scar on the penis could be found. A similar wart on the anal margin, condylomatous in nature, was examined, and a film made from the serum obtained from it. After staining by Fontana's method, numerous *Treponema pallidum* were found.

WATER EXAMINATIONS.

A weekly examination of the water supply was carried out. The water was always found of good quality except during the rains, when lactose fermenters were often found in two cubic centimetres. Normally in the dry weather lactose fermenters were not present in fifteen cubic centimetres. It was not considered necessary to chlorinate the supply at any time.

Many examinations were made of the Rawalpindi Cantonment wells with a view to finding the cholera vibrio. Cholera-like vibrios were of common occurrence, but on no occasion was the true cholera vibrio isolated.

Bacteriological examinations of water supplies of other stations were always difficult, and it was found that the only satisfactory way is to take the necessary media and apparatus to the station concerned and "put up" the test there, returning the inoculated media to the laboratory incubator as quickly as possible. This method was especially necessary during the hot weather.

Purification of Water Supplies.—Tests were carried out to ascertain the dose of bleaching powder necessary for several supplies in the Rawalpindi area, and the results were sent to the medical officer concerned.

Solutions of bleaching powder were also supplied to the ambulance trains for use in their water tanks, but it was soon found that the amount of available chlorine decreased very rapidly, and as fresh supplies could not always be obtained when the train was away from Rawalpindi, the method was given up.

The powder itself also deteriorated very rapidly during the heat of May and June, e.g., one sample which contained twenty-five per cent. available chlorine on June 6, 1919, was found on July 1, 1919, to contain only 16·3 per cent, although the bottle containing it was kept well corked in a cool, dark room (i.e., a loss of twenty-five per cent of its chlorine in about three weeks). The only remedy for this appears to be to obtain

frequent fresh supplies of bleaching powder in small quantities, not to indent for a large amount and keep it in stock. A sterilizing solution of bleaching powder, sodium carbonate, and sodium bicarbonate was next made in the laboratory, and so prepared that 1 ounce sterilized 100 gallons, so that the 100-gallon tanks in the train could be readily treated. This, while much more stable than ordinary bleaching powder solution, was not considered of much value, as after keeping for one month in the hot weather the loss of chlorine was so great as to render the routine issue of the solution more dangerous than otherwise. As long as fresh weekly supplies of it could be obtained, however, the method was ideal, as no taste whatever was produced in water properly treated by it, and the sterilizing effect was practically instantaneous. A pint of water stirred with a rod dipped in the solution was proved bacteriologically to have become immediately free of all intestinal organisms in 100 cubic centimetres, which was the largest amount tried. Its use as a water sterilizing agent was not advised, owing to the difficulty of maintaining a fresh stock of the solution. For use in ambulance trains the ordinary chlorine box apparatus was considered more suitable, and was taken into general use.

Examination of Laboratory Air.—A plain agar plate was exposed for one minute on the working bench in October. After twenty-four hours' incubation it was found to be covered with innumerable colonies and moulds. Six apparently different colonies were examined. Four of these were found to be *B. subtilis*, one staphylococcus, while the sixth was *B. fæcalis alkaligenes.* On two occasions, when plating blood on Conradi's medium for enteric organisms, *B. coli communis* was isolated. This also probably was due to air contamination. After the construction of a dust-proof media room, an agar plate was exposed in the same way. Only one colony was found on the plate, which shows the value of such a room for storing media and for plating.

AROUND ARCHANGEL IN 1919.

By Colonel G. St. C. THOM, C.B., C.M.G., C.B.E.
Army Medical Service.

I came home on leave from Cologne towards the end of December, 1918, and received orders the following day to proceed by the next ship to North Russia. I was heartily congratulated by my friends and relations on my chance of winter sports in a place unlikely at that time to be largely patronized by visitors from England or elsewhere.

We arrived at our destination towards the end of January, 1919, and it was easy to see the first day that no winter sports were to be had there; and this opinion was fully corroborated later on by several long sleigh drives up country on tours of inspection. The wide flat wastes of the snow-covered rivers with the ground on both banks, for hundreds of miles, covered nearly to the water's edge with dense forest, did not lend themselves to ski-ing for pleasure or toboganning. Some skating was obtained on flooded tennis courts in Archangel, but none was possible on the rivers and lakes owing to the depth of snow lying on them.

In summer, good fly fishing was to be had on some of the rivers within easy reach of Archangel, and, in winter, a few officers went out after bear. During the early days of winter the bear seeks out a suitable spot to hibernate and scoops out a hole in the snow in which he lies. In time the snow, completely covering his body, forms a mound from the top of which his breath can be seen coming out at regular intervals through a small hole. The villagers dig him out, and as the bear emerges, dazed with sleep, he can be very easily dispatched.

From the little that has been said above, it will be seen that there are very few inducements to take men out of doors during the winter months, and these were still fewer in the smaller villages up country where our troops were billeted. The difficulty of obtaining exercise no doubt conduced largely to the depression from which nearly every one suffered more or less. The long dark hours spent in overheated rooms, from which little could be seen owing to frost on the window panes, the long intervals between mails with the consequent lack of news from home, the absence of noise from the snow-covered roads, all contributed to increase the sense of isolation.

There was, of course, the case of the American soldier whose depression was solely caused by the anxiety of the authorities to send him home. I came across him while inspecting a mental ward in a hospital for American troops in Archangel. My attention was attracted by his appearance of health, and, on inquiry, was informed by the medical officer that the patient was insane. I asked what his symptoms were, and was merely

told: "Say, he wants to stop here." No further explanation appeared necessary.

British hospitals had a very good name amongst the Russian troops, and they frequently preferred to be treated in them rather than in their own. Their officers almost insisted on being sent to our hospitals, and it was frequently difficult to put them off. On one occasion, when visiting one of our hospitals, which was very full, I was confronted by an irate Russian major who stood stiffly to attention, and in voluble English announced his intention of committing any crime that might prevent his transfer. His manner was firmness itself when he remarked: "I will go to any lengths, sir, I will even call you a scoundrel!" Apparently he had an idea that if he were tried by court martial his stay in that hospital would be prolonged.

During the winter the temperature is, as a rule, about 10° to 15° below zero Fahrenheit, though on several occasions, for a few days at a time, the thermometer goes down to $-30°$ or $-40°$ F. The air is very dry and still, and the lower the thermometer the more still the air becomes, and round about $-40°$ F. there is absolutely no movement at all. The most trying days are those when the wind blows at a velocity of fifteen miles or more an hour with the thermometer standing at 10° to 20° below zero Fahrenheit, and on days such as these frostbites are common.

On tours of inspection, when day after day was spent lying full length in a sleigh, I found that in addition to ordinary home winter clothing the following were essential: A fur cap, with the ear flaps turned down and tied under the chin, two pairs of thick socks, a long thick fur-lined coat, and a pair of "Walinkies" (felt boots reaching to the knee), with half an inch of dried grass in the feet. Fur-lined leather gauntlet gloves, such as are worn by the Royal Air Force, are very desirable to avoid frost-bite. Everything must be loose, and especially the gloves and boots. The best coat of all is made, like a night-shirt, from two reindeer skins, and reaches to the knees and has a hood. In addition to all this clothing four or five blankets are spread over you as you lie in the sleigh. Ponies and sleighs are changed every twenty to twenty-five versts at rest-houses, in which hot water for tea or cocoa is always obtainable. A hot non-alcoholic drink every two or three hours is a real necessity to travellers. The rest-houses are unbearably hot, and it is as well if one has to sleep in them to have the bed well away from the walls, which are always infested with bugs. On one of these tours my D.A.D.M.S. and I spent such an uncomfortable night that we decided to travel day and night till we returned to Archangel rather than sleep in any of the houses on that particular line of communication. On that occasion the total distance covered was about 450 versts (16 versts = 11 miles).

The ponies can do seven to eight versts an hour between stages, but as, at every halt, ponies and sleighs are changed—necessitating the transfer of all the baggage—and there is frequently delay in obtaining fresh ponies,

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you cannot expect to average much more than four versts an hour throughout a journey. Snowstorms also cause delay and during one which lasted thirty hours our progress was not more than three versts an hour between stages.

The thaw takes place early in April and the weather during April and part of May is very similar to that experienced in England during December and January. The people of Archangel do not look for summer till May 20, and so it turned out in 1919. Up to May 19 it was bitterly cold, May 20 was balmy and like a June day at home. A few days later people were bathing in the Dvina, and the island of Kegostrov, in the middle of the river opposite Archangel, became a fashionable bathing resort. From then on it steadily became warmer, and during June, July, and part of August the thermometer ranged between 80° and 90° F. in the shade. Spring emerged into summer in a few days and in an incredibly short time the whole country was a vivid green. Daylight was continuous and therefore growth went on night and day.

The nights were comparatively cool and one could always sleep, and punkahs or fans were never necessary. Mosquito curtains however certainly were. The only place I have struck comparable to the villages on the banks of the Dvina and Vaga Rivers for mosquitoes is the Woolar Lake in Cashmere at the beginning of September. In a barge anchored in mid-stream little or no annoyance was felt, but it was an absolute necessity, if living fifty yards or more from the river bank, to tub, shave and dress under a mosquito curtain. During the day biting flies abounded; "tabanidæ" I believe they are called, and were an intolerable nuisance on the rivers and unbearable in the forests.

During the summer months most of us up country indulged in a swim before dinner. The water was warm, too warm, as one always felt rather slack afterwards from staying in a long time, but it was nevertheless a pleasant relaxation.

Swimming was a favourite pastime with the better class of Russians in Archangel, and publicity was no obstacle to them. One Sunday evening in mess, an officer said he had arranged for a mixed bathing picnic for the following afternoon on the island of Kegostrov, and he hoped as many would turn up as possible. One officer, who had not joined a swimming party before, was asked if he would go, but declined because he had no bathing suit. He was told that a vest and pants, supplemented with safety pins, made an excellent substitute. This he debated for some time in silence, but at length, during a hush in the conversation, he was heard to say, "All right, I'll go, but I'll no send my washing till Tuesday."

The flat-bottom Russian barges, built for transporting timber, were by the mother of invention transformed into highly successful hospital craft. This work was begun early in the year, and the sides were built up above the deck and roofed over. They were towed by small tugs whose sole fuel was wood which was obtained as required from stacks piled, every four

or five versts, along the banks of the rivers. The accommodation of the barges varied from twenty to 100 beds, and their main advantage was that they could be readily moved up the rivers in the wake of the troops. The roads along the river banks were almost impossible for wheeled traffic. In July the rivers became very low, more especially the Pinega and Vaga, both of which became quite unnavigable to any vessel drawing more than 20 inches, and the sick and wounded had either to be cared for in forward areas or be laboriously transported in country carts to the points where these rivers flowed into the Dvina, and where the patients were picked up by light-draught paddle steamers passing down on their way to the base. On a trip to Archangel from Troitsa in July, I counted at one point, from the deck of the small steamer I was on, no fewer than twenty-one vessels of varying sizes stuck fast in the river, and on my return journey three days after recognized many still in the same predicament, with their passengers very bored aud clamouring to be taken off.

The weather in September was pleasant but the evenings gave a foretaste of what to expect in a very short time, and I think there was very little regret amongst any of us when, towards the end of the month, the last vessel swung down the river and the cathedral domes of Archangel faded behind us.

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PRELIMINARY COMMUNICATION—PARASITES (? DEVELOPMENTAL STAGES OF *SPIROCHÆTA RECURRENTIS*) IN THE LIVER OF A FATAL CASE OF MESOPOTAMIAN RELAPSING FEVER.[1]

By Lieutenant-Colonel J. C. KENNEDY.
Royal Army Medical Corps.

These observations are the result of the histological examination of two fatal cases of relapsing fever. One outstanding feature of the fatal cases in this country (Mesopotamia) has been the cerebral symptoms, and the examination of the brain was the primary object of the investigation. In the first case only the brain was examined, and the appearances were so interesting and suggestive that on the next opportunity a careful examination of the liver, spleen, kidney and bone marrow was made, as well as of the brain. I hope to place on record the full results as soon as I can obtain more material, but that must wait until the relapsing fever season comes round again. Meanwhile, I wish to record the findings in the liver up to date.

The case was that of an Arab coolie, who died twelve hours after admission to hospital, and was not in a condition for the administration of salvarsan. He is reported to have been ill for four days before admission. Spirilla were found in the peripheral blood on the morning of admission, but not at the time of the post-mortem. The liver and spleen were both enlarged and tender, and there was marked jaundice. It is rather important to try to fix the duration of the illness, but it can be only roughly estimated that death occurred about the end of the fifth day. That the crisis was near at hand is probable, as the only organ in which spirilla were found post mortem was the brain—e g., in smears from the extravasated blood in the meninges and in certain portions of the cortex.

The histological changes in the liver were very striking, and may be briefly enumerated as follows :—

(1) Great destruction of the liver cells, the periphery of the lobule being, perhaps, the least affected. I should estimate that quite one-third of the total number of liver cells was affected.

(2) Infiltration of round cells into Glisson's capsule.

(3) Engorgement of the portal and the hepatic veins and of the intralobular capillaries.

(4) Deposition of a very considerable amount of pigment.

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[1] Forwarded to the Editor of the Journal of the Royal Army Medical Corps through the D.M.S. Mesopotamian Expeditionary Force, on August 29, 1919, but not received in the War Office. Resubmitted to Editor of the Journal of the Royal Army Medical Corps September 8, 1920.

(5) The presence of numerous parasites of a protozoal nature. I confine myself, for the purposes of this communication, to a description of these latter.

The Parasites (see Diagrams).

Situation.—They were scattered throughout the lobule, either inside liver cells or lying free in spaces surrounded by the vacuolated remains of degenerated liver cells, endothelial cells and leucocytes.

Staining Reactions.—Their reaction to ordinary stains is feeble, but with Heidenhain's iron hæmatoxylin or prolonged staining with Leishman or with Weigert's iron hæmatoxylin a pretty fair idea can be obtained of their structure.

Description.—They are round or oval bodies, varying in size from four to eight microns. It is difficult to estimate the amount of shrinkage in sections, but the larger ones seemed to be just smaller than a polymorph leucocyte. The smallest were found in the liver cells, surrounded by a clear halo (? shrinkage), in some the nucleus was not visible, and the protoplasm stained rather deeply and uniformly, but the majority showed a small feebly staining central nucleus (fig. 1). With the growth of the organism the nucleus becomes more evident and proceeds to divide into two by mitosis. This stage, with two nuclei (figs. 5, 10, 12), was the predominant one, and though a few were found still inside a comparatively uninjured cell, the majority were lying in spaces, as I have already mentioned, surrounded by the remains of degenerated liver cells and phagocytes. The nuclei at this stage were elongated, and rather ragged in appearance and stained feebly. After the division of the nucleus the protoplasm segments. A certain number of organisms showing more advanced stages of segmentation were found. In these the nuclei were smaller, more compact, and stained more deeply, some showing a ring appearance, and the corresponding segmentation of the protoplasm was likewise more evident. The largest number of segments or spores counted in any one was six, and all intermediate stages were seen. At no stage could I discover any trace of a cyst wall.

After knowing what to look for I returned to the examination of an impression preparation made from the liver, stained with Leishman, and was able to recognize only a very few perfect specimens of the parasite. It was evident that these bodies are of extreme fragility, and special methods of fixation will have to be adopted in making such preparations. As it was, there were large numbers of fragments, but a few good specimens were recognized lying free and in liver cells.

Comment.

It is to be regretted that so far I have been unable from lack of material to confirm the presence of these parasites in other cases of relapsing fever, but I anticipate having opportunity during the coming season, as relapsing fever is endemic in these parts.

There is little doubt in my mind that the organisms I have described will prove to be the early stages of schizogony of the *Spirochæta recurrentis* in the vertebrate host. The reappearance of the spirochætes in the blood of the vertebrate host can be explained only by some such phase of development which so far has eluded observation.

Breinl has described in the case of West African tick fever the formation, in the internal organs, of cysts, in which small red granules appear, which granules are supposed to be the cause of the re-infection of the blood; but, judging from the very abridged description of Breinl's work, which is the only one available to me at present, his observations differ considerably from the above. As stated, I could find no evidence of a cyst wall, and two points seem to confirm this, first, the extreme fragility of the parasites as noted in smear preparations, and, secondly, the effective action of salvarsan in preventing a relapse, even if administered during the apyrexial period.

That the liver is the seat of election for the development of the parasite is borne out by the clinical symptoms, and though there were histological changes present in the spleen and the kidneys, I have not so far found any developmental forms of the parasite in these organs. No changes were noted in the epithelium of the interlobular bile ducts. A striking histological feature is the great increase of macrophages, particularly in these cases, in the meninges.

A phase of schizogony has been described in the case of one other spirochæte—e.g., *S. gallinarum*. In this instance the "infective granule" (Balfour) enters the red cells of the fowl and initiates the phase of development which culminates in the formation of merozoites and the spirochætes of the relapse. Likewise, I believe that the formation of a granule is a necessary preliminary of the phase of schizogony of the *S. recurrentis*, and I have noticed that the great majority of intracellular spirochætes show a well developed granule.

I wish to express my indebtedness to Major V. N. Whitamore, O.B.E., I.M.S., and Captain S. W. Page, R.A.M.C., for providing me with material.

EXPLANATION OF PLATE.

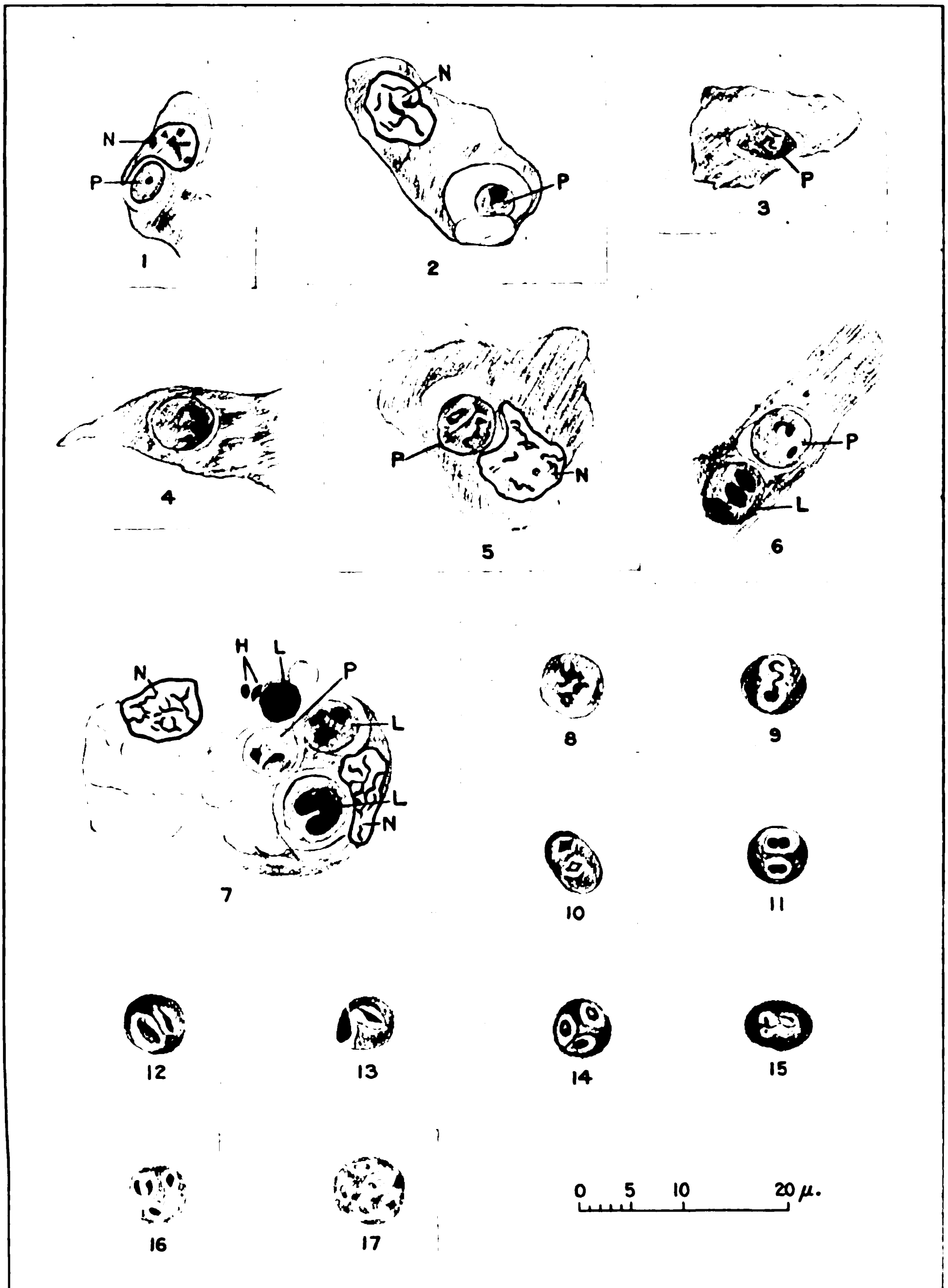
Camera lucida drawings showing the parasites (P) situated inside liver cells. Figs. 1-7.

Fig. 5 shows commencing segmentation of the parasite.

Fig. 7 shows an advanced stage of degeneration of the liver cells with invasion of leucocytes.

Nucleus of liver cell—(N). Leucocytes—(L). Pigment—(H).

Camera lucida drawings illustrating different stages of the parasite as seen in sections of the liver. Figs. 8-15.



To illustrate "Parasites (? Developmental Stages of *Spirochæta Recurrentis*) in the Liver of a Fatal Case of Mesopotamian Relapsing Fever," by Lieutenant Colonel J. C. KENNEDY, R.A.M.C.

Clinical and other Notes.

DESCRIPTION OF A SMOKE TRENCH LATRINE.

By Captain H. STOKES.
Royal Army Medical Corps.

I DESIRE to describe a latrine trench—which served under some unusually necessitous conditions—in the hope that it may be given a further trial, and a wider opinion formed regarding its claims.

As shown in the diagrams, the trench is half a metre wide and is dug to a depth of two metres. A convenient length is four metres. Laths—in the original male bamboos were used—are now placed across the trench, filling all

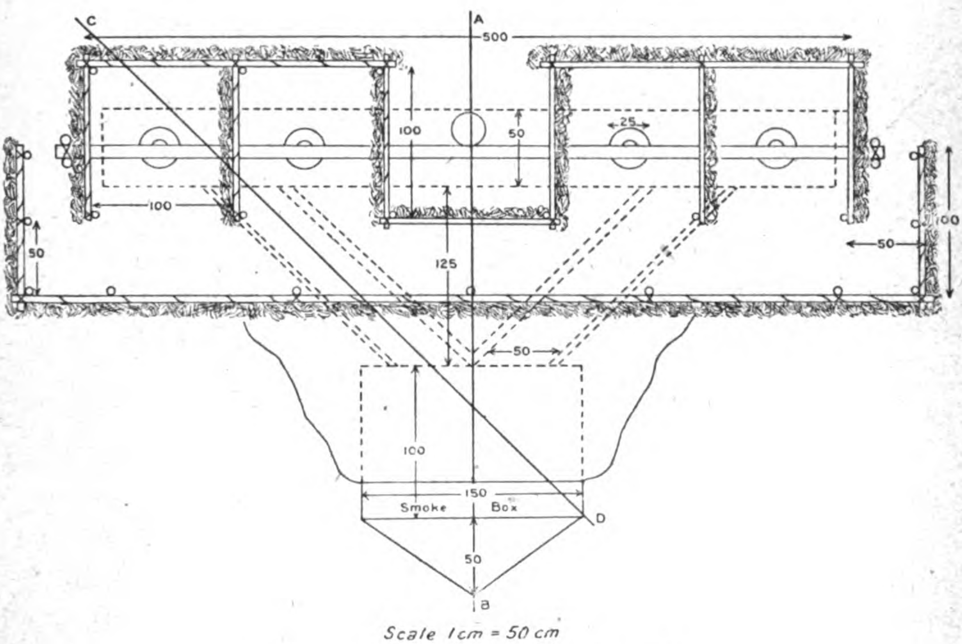


Diagram 1.—Shaded area = made ground.

the spaces between the five openings for four seats and one urinal. These supports should be about a metre long, well supported on each side of the trench. Built up on these is a platform of the excavated earth mixed with wood-ash worked up with water. The openings for the seats are to be round, the necks of earthenware water-pots give a finished appearance, to take lids of plaited grass, with a central tag as a handle. A pole about 9 or 10 cm. above the platform is fitted along the entire length, supported on Y-shaped posts. On one

side of the trench a small mud furnace is built with an upward slope of a two-way smoke flue opening into the trench. These flues are capacious, with a measurement of 10 square cm., and the furnace is large enough to receive an occasional armful of damp grass. The important point about the flues is that they must have a rather steep slope. The whole is now screened off and roofed with brushwood.

I may now state that this was the form of trench I had built for men when I was a prisoner-of-war in East Africa, modified from one the Germans had at their Base Hospital, and into which the enteric and dysenteric stools were emptied, after being mixed with wood-ash.

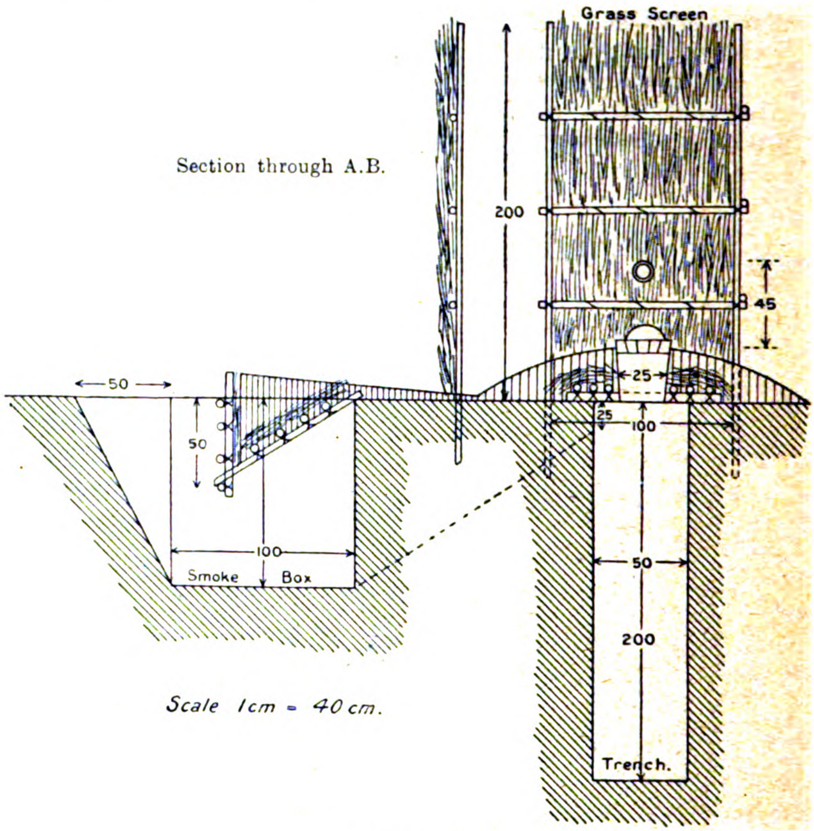


Diagram 2.

The conditions which this trench had to serve were these:—

(*a*) The latrines had to be in the zariba, and in view of the guard.

(*b*) There was nothing in the way of bucket and lid or disinfectant to be obtained.

(*c*) These confined zaribas were our only living spaces for weeks on end.

I have had the trench with the important features of depth and darkness in full use by two days, and when very fortunate completed in four.

GENERAL.

These smoke latrines stood the shock of the terrible rains to which they were subjected. They dispense with the problem of ultimate disposal of the sewage—fæcal matter undergoing a very rapid disintegration at the temperature obtained; urine also was speedily evaporated, due somewhat to the heat of the smoke-box.

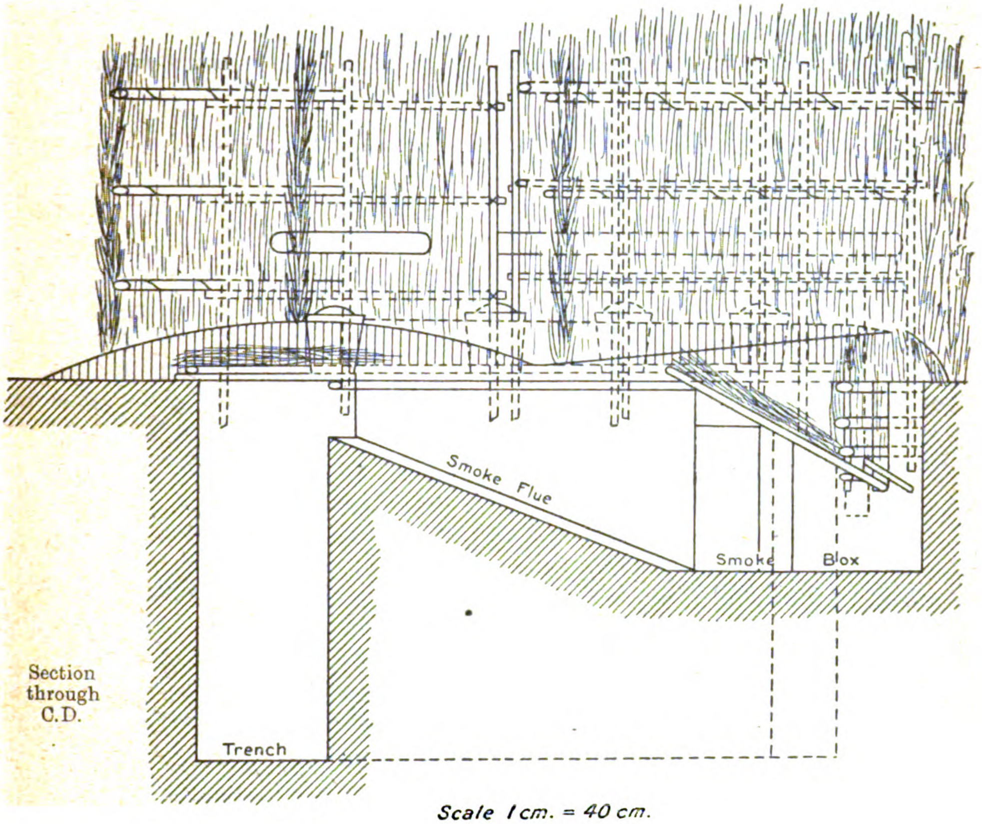


DIAGRAM 3.

Provided wood-ash is sprinkled on accidentally deposited matter on the rims of the openings, and swept in, it is practically fly proof. Nothing beyond the dows or pangas (bush choppers), carried by all units in the East, and the entrenching tools are required.

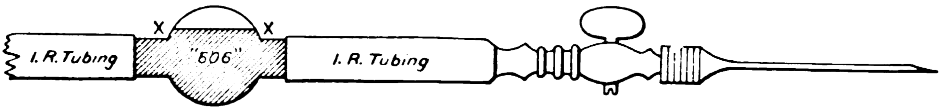
The diagrams are all to scale $\frac{1}{25}$th nat., the dimensions being on the centimetre scale.

I am indebted to Lieutenant M. J. W. Jeffreys, W.A.F.F., for his kindness in preparing the diagrams.

A BULB IN THE "606" APPARATUS.

By Captain J. H. WHITESIDE.
Royal Army Medical Corps.

The use of a bulbous window in place of the usual straight one near the Harrison tap in the "606" apparatus relieves the administrator of any anxiety regarding the injection of air into the veins, as if there should be any air left in the tubes after the usual manipulations for expelling it, it is quite impossible for it to get past the bulb. Any bubbles of air coming down the tube find their way



to the top of the bulb, as seen in the illustration where the air is represented by the clear part. Until the air becomes so great in quantity that it gets to the crosses it is impossible for it to pass to the needle. Any air in the bulb can be easily expelled by holding the needle up with the tap open. The apparatus is extremely simple and cheap. To prove the truth of the above allow some air to pass down the tube and watch the effect. A convenient size of bulb is ¾ inch outside measurement. The apparatus should lie in a horizontal position.

THE VALUE OF SMALL FISH REGARDING THE DESTRUCTION OF MOSQUITO LARVÆ.

By Major J. E. M. BOYD.
Royal Army Medical Corps.
Officer-in-Charge, War Office Entomological Laboratory, Sandwich, Kent.

The value of small fish such as sticklebacks, "minnows," and other fry as regards their use in the destruction of mosquito larvæ, in England, has caused some difference of opinion, so steps were taken by means of dissections to prove their value or otherwise.

It is generally admitted that under unnatural conditions these small fish will eat large numbers of mosquito larvæ; this has been frequently observed both in this laboratory and elsewhere, but it is considered by many that the reason for this is that, the fish being kept in captivity soon eat all the small creatures in the water and, being hungry, are only too glad to avail themselves of any addition to their diet.

Another point, brought forward by those who do not consider that fish are of much value in this respect, is that fish and larvæ may be found in considerable numbers, living together, in apparent harmony, in the dykes and water-courses, with no marked diminution in the number of larvæ.

There is no need, in this article, to enter into a full description of the dyke-land in this locality. This has already been most ably described by

Major Angus Macdonald, O.B.E., R.A.M.C., in the section written by him in "Observations on Malaria," issued by the War Office in 1919, a most interesting and instructive publication to read. It will be enough to say here that the surrounding country is low-lying, intersected by many dykes, situated near Sandwich, Kent. "These dykes are designed to drain the land by being allowed to run out in the winter time, and in summer they are used to check and let in, so as to form fences and supply drinking water for stock. The aim is to keep water at a constant level. Water is let in from the river at high tide, in such situation as will ensure its being fresh, though this is not always attained, and in August and September the water in the river is apt to be brackish." (Macdonald.)

There is a party of men whose duty it is to keep the dykes as clear of weed as possible and to look after the banks. This party has not been noticed working near the laboratory lately and some of the dykes are badly choked with weeds.

There are several species of fish in the dykes, roach, tench, jack and perch, and in a railway "burrow pit," near the line, are also bream. Young eels and sticklebacks are frequently seen, the latter often in large shoals.

Larvæ of anophelines and culicines can be found in most of the dykes, excepting in those which contain a high percentage of salt.

Anopheline larvæ have been found in waters having a salinity up to 339·0 parts of chlorine per 100,000. These were larvæ of *Anopheles maculipennis*, as they are not so particular as to the condition of the water, and are also more plentiful than *Anopheles bifurcatus*, the only two British anophelines found in this district. The latter is also said to prefer fresh water, if it does not actually avoid brackish water. (W. D. Lang.)

Strangely enough, only recently a few *A. bifurcatus* larvæ were taken in a dyke near by, the taste of which was undoubtedly brackish. This may, however, be an isolated case, a female mosquito having been blown out on to the dykeland and not finding a more suitable place, ovipositing in the brackish water. It is not a general rule to find larvæ of *A. bifurcatus* in the brackish dykes.

The fish used for the purpose of this article were caught at random in the dykes around the laboratory. These dykes were rather thickly covered with weeds, *Enteromorpha intestinalis* and *Spirogyra* predominating. Larvæ were found present in moderate numbers.

Fish were plentiful and easily caught by means of a net. These fish were small, about ¾ to 1¼ inch in length, dark greenish above and silvery below and belong to the species *Gasterosteus pungitius* Linn., the ten-spined stickleback.

Thirty of these were killed, the stomachs and intestinal tracts removed and examined, after dissection, under a low power microscope.

The diet seemed varied, but was, as far as could be seen, entirely animal in nature. Various species of crustacea, such as daphnia, cyclops and cypris were plentiful, also, in most cases, mosquito larvæ had been taken.

As may be seen by the table at the end of this article 24 (80 per cent) had eaten mosquito larvæ, one as many as seven, and 6 (20 per cent) had not. It is admitted that the number (30) examined was small, but it showed that considerable numbers of larvæ must be destroyed by these fish. In addition to whole or almost whole creatures, the stomachs and intestines contained a certain amount of digested matter, the composition of which could not be made out.

In some cases almost entire larval skins with the head attached were seen, in others only the heads. No notice was taken of pieces of heads or other fragments of larvæ, only entire heads were recorded, nor were there any signs of ova or pupæ.

In all cases the larvæ were partly digested, so that it was not possible to say for certain to what species they belonged, but a most careful examination failed to show any signs of siphon tubes, so the larvæ were undoubtedly anopheline in origin, though a few larvæ of *Culex pipiens* were taken from these same dykes. In all probability the larvæ were those of *A. maculipennis*, the latter being more common in these dykes, though as stated above *A. bifurcatus* larvæ were found recently.

It is not the object of this article however to enter into the question of the differentiation of the anopheline larvæ, but to endeavour to show that small fish not only in unnatural, but also in natural conditions, are of considerable use in the destruction of anopheline larvæ and it is hoped that this object has been attained, though it is readily admitted that fish alone will not act as exterminators, owing to the large numbers of larvæ which need to be destroyed.

Several dissections of these fish have been mounted as microscopical specimens and will be gladly shown to anyone visiting the laboratory.

Much has been written by various authors on this subject, though so far it has not been possible to trace any mention of the English fish which are useful, except that Macdonald in the book noted above, page 247, mentions the presence of roach, tench, perch, jack, eels and sticklebacks in the dykes here, the latter having been proved to eat larvæ.

"Millions" from Bardados and several species of fish from India, the United States and elsewhere are also known destroyers of larvæ.

Hindle in "Flies and Disease" referring to natural enemies states: "So far the hope that by the introduction of some natural enemy the number of the anophelines in a country could be affected has not met with much encouragement, nevertheless under certain circumstances the use of suitable small fish has an application."

MacGregor in the "Question of Natural Enemies" published in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS in March this year appears to have little use for fish. He says: "Unquestionably they are of some value but only under the *most unnatural* conditions."

From the figures given in the table at the end of this article I think it will be seen that the conditions need not be so markedly unnatural for fish to prove useful.

The condition of the dykes from which fish were taken were most natural in all respects. The weeds were plentiful, thus giving the larvæ considerable protection, and though as already stated the fish cannot cope with the large numbers of larvæ present, they do destroy a considerable number. When the weeds have been cleaned from the dykes the advantage will be on the side of the fish, and they will probably prove of more use than even at present.

Certainly the average number of larvæ in the fish examined was only about two, but if every fish in the dykes contrived to eat two larvæ daily (twelve showed more than two) they must help to a certain degree to reduce the numbers of larvæ. The surface feeders such as the minnows and sticklebacks are the most useful in this respect.

In conclusion I would add that I am greatly indebted to Serjt. J. L. Douglas, R.A.M.C., for help in this work, he assisted in catching the fish and also removed the stomachs for me to dissect.

Since the above notes were written, a few small eels have been examined. Their diet appeared to consist almost entirely of chironomous larvæ; being bottom feeders this is what was expected.

TABLE SHOWING STOMACH CONTENTS OF FISH EXAMINED.

No.	Larvæ anopheline	Daphnia	Cyclops	Various, chiefly cypris	Remarks
1	—	9	—	2	..
2	2	6	—	3	..
3	4	3	1	1	..
4	—	7	5	—	..
5	—	2	—	—	..
6	7	—	1	1	Larvæ of Ceratopogon
7	1	—	2	1	..
8	2	5	7	9	..
9	—	2	—	—	..
10	2	2	—	1	..
11	3	—	1	3	..
12	3	4	1	—	..
13	4	1	—	—	..
14	3	6	3	2	..
15	4	9	3	—	..
16	3	2	1	6	..
17	1	—	3	2	..
18	6	3	3	2	..
19	—	—	7	7	..
20	2	4	18	—	..
21	1	—	1	—	..
22	2	—	1	2	..
23	—	3	2	—	..
24	1	1	3	—	..
25	4	3	5	2	..
26	2	1	11	6	..
27	3	2	20	2	..
28	1	3	2	—	..
29	5	—	12	—	..
30	3	1	7	—	..
30	69	79	120	52	..

A CASE OF LOBAR PNEUMONIA WITH DELAYED RESOLUTION.

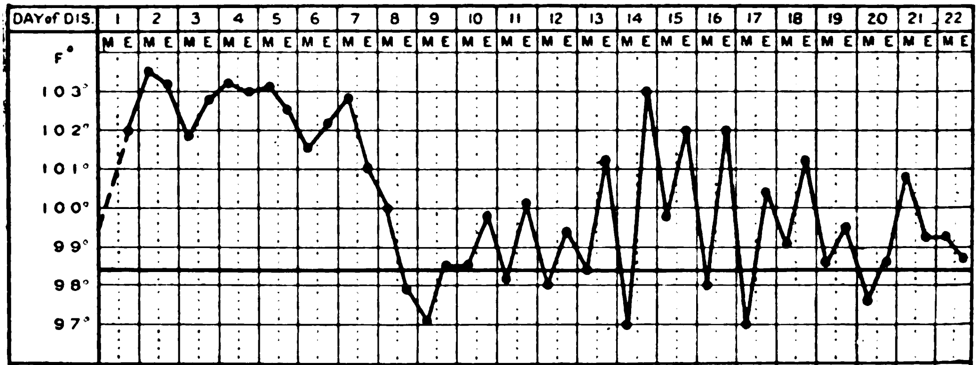
BY MAJOR A. C. AMY, D.S.O.
Royal Army Medical Corps.
AND
MAJOR W. R. O'FARRELL.
Royal Army Medical Corps.

PRIVATE X., aged 19, reported sick in France on March 10, 1920, suffering from cough, expectoration and general malaise. On March 12 he was admitted to hospital, and transferred to England on March 17. He arrived at this hospital as a cot case in the early hours of March 18. The only document which accompanied him was a medical transfer certificate: diagnosis "bronchitis."

On examination patient showed no physical signs of disease, and seemed to be

fit and well. At fourteen hours he was allowed "up." At sixteen hours he had a severe rigor and headache, and he looked and felt very ill. At twenty-two hours he developed a short, dry, restrained cough, and a sharp stabbing pain below the inferior angle of the right scapula, through the chest to the right nipple. From then until March 24, i.e., seventh day of the attack, the patient showed all the usual signs and symptoms of a fairly severe lobar pneumonia of the lower lobe of the right lung.

Between the morning of March 24, and evening of March 25, although the temperature fell steadily from 102·8° F. to normal, and pulse and respiration rates decreased, the patient's general appearance was unsatisfactory and he felt ill. During the next twenty-four hours the temperature did not rise to 90° F., but the pulse and respiration rates rose to 128 and 48 respectively. At this time the patient had a most distressing and frequent cough, and expectorated large amounts of rather offensive pneumonic sputum. Respiration was hampered, and patient was cyanosed. The right lower lobe showed all the signs of marked consolidation, but there was an entire absence of bronchial breathing and transmission of voice sounds.



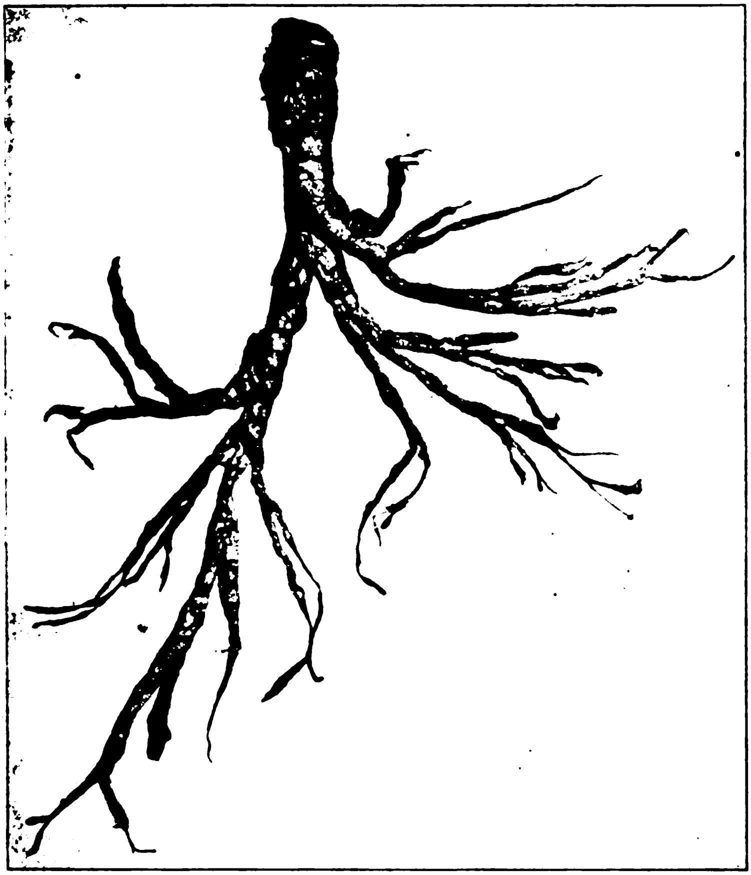
DAY of DIS.	PULSE M	PULSE E	RESP. M	RESP. E
1		142		42
2	140	132	48	36
3	132	108	40	28
4	112	112	34	34
5	112	120	32	32
6	116	114	36	34
7	120	108	36	32
8	108	92	32	28
9	92	100	32	36
10	128	120	48	40
11	108	118	44	44
12	112	118	40	40
13	112	136	32	48
14	120	134	40	48
15	132	126	50	38
16	132	132	44	30
17	120	136	32	44
18	122	144	40	48
19	126	136	36	40
20	124	136	48	40
21	126	114	40	36
22	120	120	36	40

The above conditions persisted throughout the period March 27 to April 8, 1920. Cough and expectoration were not so frequent, but the bouts were severe, and moderately offensive sputum was brought up in large quantities. Breathing was much distressed, and cyanosis was nearly constant and always fairly deep; it was occasionally replaced by the pallor of short attacks of collapse. The daily temperature was intermittent : sometimes remittent. Pulse rate 108 to 144 : respirations from 32 to 50. The right lower lobe continued to show signs of extreme hepatization, while the uninvaded portions of the lungs were dull on percussion and covered with râles. There was marked accentuation of the pulmonary second sound.

From March 29 to April 1, the patient was dangerously ill. On the morning of April 1, i.e., sixteenth day of the disease, he felt an acute pain below the right scapula and asked the ward sister to rub his back. After being gently

massaged for a few minutes the patient was suddenly seized with a violent, prolonged fit of coughing, and became deeply cyanosed. He then spluttered for a few seconds, appeared to choke, and rolled limply on to his back, utterly exhausted. The ward medical officer rushed to the bedside, and the patient in a last desperate paroxysm turned towards him and coughed. . . . The material which was expectorated is described below by one of us (W. R. O'F.).

There was an immediate recovery from the cyanosis and a temporary amelioration of the symptoms. The signs of delayed resolution continued unchanged.



On the evening of April 4, a similar incident took place. On this occasion the cast of the bronchus was slightly smaller—about ten centimetres in length.

On April 6, a third and last cast about four centimetres in length was ejected to the accompaniment of the same alarming symptoms.

Since the latter date the patient has made a slow but steady recovery, and the right lower lobe has by now (May 25, 1920) partially regained its functions. The patient is convalescent and "up."

PATHOLOGICAL NOTES.

On April 1, 1920, a sputum cup containing a ball of mucoid substance was sent down to the laboratory for examination. The mucoid ball had been ejected during a paroxysm of coughing by Private X., a case of unresolved lobar pneumonia whose history has been outlined above. The specimen presented the following appearance: Whitish-yellow spherical mass about six centimetres in diameter bathed in muco-purulent but not blood-stained sputum. On floating the mass in water and by gentle manipulation, it proved to be a bronchial cast of unusual size, which was loosely rolled together and enveloped in a shroud of filmy mucus.

From a tapering cylindrical stem with a hemispherical end, one centimetre in diameter, at a distance of two centimetres two superimposed branches took origin. The main trunk now continuing for a distance of 2·5 centimetres, divided into two smaller branches. Each of these branches and those arising higher up were arborized, the whole specimen presenting a "tree-root" appearance, the terminal rootlets of which tapered down to 0·5 of a millimetre in diameter. The greatest length of the specimen from base of stem to end of most distant rootlet measured thirteen centimetres (see photograph). Unfortunately it was impracticable to obtain a satisfactory photo while the specimen was fresh, and before shrinkage had occurred. The same patient produced two smaller casts on April 4 and 6, but the one described and illustrated was the largest and most perfect specimen.

A portion of one of the casts sectionized presented the following microscopical appearance. The section consisted of a fairly compact mass of structureless fibrin arranged in wavy bands and staining a faint pink with eosin. The fibrin around the circumference appeared to be dense, as a result of compression against the bronchial wall. There was no trace of bronchial epithelium round the periphery. In the fibrin reticulum many leucocytes were to be seen, chiefly polymorphonuclears and lymphocytes. Here and there were masses of Gram negative diplococci. In some instances these diplococci were contained in the cytoplasm of the polymorphonuclear cells evidently phagocyted. Specimens stained by the Ziehl-Neelsen method failed to show acid-fast bacilli.

We have to express our indebtedness to Lieutenant-Colonel F. S. Penny, C.M.G., D.S.O., Officer Commanding Queen Mary's Military Hospital, Whalley, for permission to publish this note, and to Mr. Miller, the civilian laboratory attendant, for his assistance.

AN UNUSUAL CASE OF SUSPECTED TUBERCULOSIS.

BY CAPTAIN J. D. MACFIE.

Late Royal Army Medical Corps.

Tuberculosis Officer to the Essex County Council.

THE War Office were good enough to put T.B. Expert after my name when the Essex County Council allowed me to accept a temporary commission in the Royal Army Medical Corps in July, 1916.- While on duty in India (invalided from Mesopotamia) Major General Corker, C.B., then D.D.M.S. of the 9th Secunderabad Division, wrote to all the units under his care to send all the medical history sheets of suspicious tuberculosis cases to me at Wellington. If

such cases needed a change to the hills, subject to his approval of course, they were sent to me there. One interesting case came to my notice.

A young soldier had joined up, and after spending several months in Egypt obtained a commission and proceeded to Mesopotamia. He developed a cough and afternoon temperature, and was invalided to India labelled N.Y.D. ? T.B. Shortly before I saw him he had been inoculated with T.A.B. at the insertion of the deltoid and a cold abscess developed. Major W. W. Browne, O.B.E., D.A.D.M.S. (Sanitary), at Wellington, examined the pus and found a nest of what looked exactly like tubercle bacilli. Lieutenant-Colonel Cornwall, I.M.S., of the Pasteur Institute, and two temporary bacteriologists (specialists) saw the slide, but although they said that the organisms were acid-fast bacilli, refused to say that the organisms were tubercle bacilli. I examined the patient several times, but found not even an academic sign in the chest. There were no tubercle bacilli in the sputum. Major P. Power, R.A.M.C., Medical Officer in charge of the case, gave him three doses of tuberculin and kindly allowed me to examine the chest and the abscess at the proper time. There were no focal, local, nor general reactions. In discussing the case with Dr. Arthur Latham, he told me that the tuberculin in use in England during the war was not reliable, and as tuberculin does not keep well in India one cannot lay stress on this negative tuberculin test. Under the circumstances I refused a definite diagnosis, but considered that there was some focus in the chest undiagnosable by clinical methods. The chest was never X-rayed.

Echoes from the Past.

THE PENSIONERS.

By ANDREW BALFOUR, C.B., C.M.G., M.D.
Director-in-Chief, Wellcome Bureau of Scientific Research.

THE features of the Merry Monarch are shrouded, veiled in verdure as the way is on Founders' Day. On the white step before the leaf-crowned column stands a little drummer, a quaint figure in red coat and three-cornered hat. His snowy beard streams over his buttons and the scarlet of his old-world garb. Irresistibly he suggests a figure from Fontenoy, for it was in some such uniform that the drummers of Cumberland beat the charge on that fatal day. But the little drummer has an easier and a safer task than those who tapped the pigskins in 1745.

It is as well, for he is an ancient of days, as is every one of those comrades whom he faces. They are drawn up on three sides of the centre court of the Royal Hospital and behind them rise the old buildings which, throughout the years, have looked down on many a similar gathering of veterans.

"*In subsidium et levamen emeritorum senio belloque fractorum,*" so runs the deep carving on the frieze of the cloistered wall. "Broken by age and

war." Truly it is so, for there linger on the precincts, there are even to be found in the scarlet ranks, men who fought in the Crimea long, long ago and who helped to quell a mutiny which unhappily was not checked at its outset, men of a rougher but possibly a better age, men at least who lived and fought at a critical period in their country's history as others have lived and fought throughout a time yet more perilous. It is for some of the latter that the red drummer waits, that the long lines of bemedalled figures, surmounted by old-fashioned headpieces, wait, with their officers, the blue-clad Captains of Invalids, at their posts and the serjeant-major in readiness.

On either side, well behind the ranks and accommodated on benches, sit those who, owing to age or infirmities, can play but a passive part in the day's proceedings. Some are very old; frail figures nearing the end of their long tenure, drowsing a little in the sun, hard of hearing, tremulous of lip, but well content to witness the show. Some are in hospital garb, the vivid blue which, of late years, has become so familiar; some, though, like Mephibosheth, impotent in the feet, sit erect, still smart and spruce, with perchance a military twist in their white moustaches, with gnarled hands grasping their sticks, with keen eyes looking out from under tufted brows. What scenes some of these eyes have looked upon, what historic happenings they have witnessed, what!—but the drummer swings his drum upon his thigh and the rattle of his sticks rises on the still air. A word of command rings out and the red ranks stiffen to attention. There is something pitiable about it, for not a few are stiff already and will be stiff till the last stiffness fastens upon them, but one and all—the bowed, the shaky, the feeble—do their best as a little group steps forth into the court and the band away to the left front strikes up a melody. Red and khaki, mark the contrast between the old and the new! The Governor, a famous soldier, well stricken in years, resplendent in scarlet and silver, with waving plumes and covered with medals and decorations; the General inspecting, likewise a noted man of war, dapper in his khaki, his leggings and his spurs, long lines of bright ribbons traversing his left breast, his sword braced, his bearing alert and reliant as befits one who has faced and beaten the Hun at the head of a British Army. "Broken in war." It is the same sad tale, for there is another General of the party who has paid the price and must needs limp as he follows his leader. A kindly leader, who is now making his round of the ranks, mindful that those he inspects cannot stand overmuch of the parade, but still speaking a word in season here and there to some old man who wears familiar medal ribbons and handled his Snider when Queen Victoria was young. It is noticeable that few of those down whose lines the General passes are of great stature. True, such as were once tall have lost their inches, for old age bows and shortens, but, even so, the majority must always have been men of medium height and many, like the drummer, are diminutive. That is always the way, the big fellow rarely lasts so well

his heart has more work to do, his machinery fails more quickly—hence few of the veterans are imposing. Yet here and there a fine figure of a man stands to attention, a great serjeant with the beard of a Louis Napoleon and the frame of a prize-fighter; a lean giant, hard and bony in his senility but with a back like a door; a burly pensioner with snow-white locks and ruddy cheeks looking like a fox-hunter in disguise. But they are few these big men, few and far between, as may be noted more especially when, the inspection over, the march past begins. The Governor and the General take post where the little drummer stood. At the word of command the files right and left turn. Alas! there are some who face the wrong way or whose slow brains do not grasp the order. Time, however, is given them and not until the shuffling of old feet upon the ground is at an end does the band give signal for the march to commence.

"Then steadily shoulder to shoulder." Such in slow measure is the air to which the veterans pick up the step. Look at them as they pass! Perhaps nowhere else will you see so remarkable a set of heads. Most of them are bearded, all are grey or white, and well-nigh every face is wrinkled. There are long white beards straggling at will, smart trimmed beards, forked beards, pointed beards, beards which are chiefly whiskers, and nondescript beards, but from nearly all the pigment has vanished. And there is every kind of feature; refined and almost saintly faces, the commonplace countenance of the average British private, dignified a little by the years, scarred and rugged visages, the plump and cheery, the thin and furrowed, the dull and impassive. Here is material for the artist, for the psychologist, for the phrenologist. There are maimed men in the ranks, men with tortuous vessels on their temples, men pale with the anæmia of age. It is hard to think of these old men as furious and lusty warriors, drunk with the battle fever, biting at their cartridges, lunging with the bayonet or smashing right and left with the butt. Yet some of them must have played their parts in orgies of blood and death and seen comrades die who have been dead for half a century and more. Very placidly they move, some even stumbling as they walk. As a march it is beneath contempt, and, truth to tell, the "Old Brigade" does not seem to care much about it. One wonders if it recognizes its own historic significance. The General speaks of the latter in a brief and soldierly address ere the pensioners disband, but one almost feels as though his stirring words fall, in a double sense, on deaf ears. But no! once the ceremony is at an end, go about amongst the veterans and talk to them—above all things visit the infirmary and you will find many a man with a lively consciousness of the glories in which he has shared. Here a garrulous greybeard will tell you all about the ball (save the mark) which shattered his hip at the Alma and left a wound which has been discharging ever since. Think of it, for five and sixty years! This man was in hospital at Scutari and saw the Lady with the Lamp, and speaks with gusto of the failure of the attempt which was

made to send her home. With his own eyes he saw a patient strangled in bed by a brutal nursing orderly and recounts how not a British soldier could be found to hang the villain. No one would soil his hand by such a task. But his finest yarn is how, by some mistake, he was called up for the Great War in 1914. "Yes," he says with a chuckle, "and I would have gone too if only my leg had let me!" Another will tell tales of India and the Mutiny and recall forgotten names and forgotten places and fierce struggles with the Pandies. Bedridden and very feeble is a third, who faced as gallant and chivalrous a foe as any we ever fought, the Maoris of New Zealand, away back in the sixties.

It is a queer dip into the past, this visit to the Royal Hospital, with its veterans, its memories, its chapel, its pictures, its banners, its golden plate and its table whereon the great Duke of Wellington lay in state at a time, *mirabile dictu*, later than that at which some of the present pensioners took the Queen's shilling.

Strangely interesting, too, has been this time-honoured ceremony to which we have been summoned by tuck of drum, the very sound which must have lured some of the old men to the colours when they were beardless boys and recked nothing of Chelsea and its Hospital. Yet now it is their home and in its wards or under its trees they await the last call, happily in comfort and often in content.

Charles the Second did many things both good and bad, but it is doubtful if he ever did a better than founding in the ancient College of Divinity, the whilom home of the Royal Society, that Hospital for "emerited soldiers" who, as the old writing has it, have been broken by age and war.

Travel.

AN AWAKENED GIANT: SOME ACCOUNT OF THE ERUPTION OF A JAPANESE VOLCANO.

By Major A. W. HOWLETT.
Royal Army Medical Corps.

In the spring of 1911, I happened to be kicking my heels in Yokohama, wondering what I should do to pass the time till the next boat went over to Vancouver. I had landed at Nagasaki some time before and visited all the beauty spots less frequented by globe-trotters in the Inland Sea. There were many things to be "done" yet from a guide-book (or American) point of view, but I had no intention of doing them. I loathe guide-books more than I do the devil; their encomiums and jeremiads alike leave me cold, and if there is any place in particular which they say must not be missed that is just the place I do not go to see. I have often asked tourists what sort of idea they would get of England by going to see

Westminster Abbey or Madame Tussaud's, and it is obvious that the many thousands who visit India nowadays in the cold weather to "do" the Taj and Benares and the rest of the show places might just as well have seen them at the White City for all the knowledge of India they bring away with them. It may be an unfortunate Philistinism, but I infinitely prefer as ministers to my æsthetic requirements the works and wonders of Nature to any of the artistic elaborations of mankind. I was thinking of making a short tour afoot through some of the unbeaten country to the north of Yokohama when chance, like an angel of mercy, pointed out the way. Not being the Kaiser, I cannot claim it as a direct interposition of Providence on my behalf, but the fact remains that just when my *tedium vitæ* was reaching the fastigium, a great volcano which had lain dormant some hundreds of years chose that moment to reassert itself. I read about it in a morning paper at breakfast time, the picture presented by the journalist was horrific; hundreds of people had been killed and thousands were homeless; dead and dying were everywhere; famine was rampant; and the minatory glow of the still outpouring lava was over it all. My mind was made up as I sat there. It seemed too good an opportunity to be missed. Dormant volcanoes do not break out every day. And besides the excitement of witnessing one of the most awful of terrestrial phenomena, there was a chance that my professional capacities might find some play. My landlord, a Frenchman who had lived long in Saigon and for whom I had done some small professional services, was ready to help me. He suffered at frequent intervals from attacks of "paludism" for which I gave him aspirin and quinine. His wife, who gave a different name to it, used to put him to bed and lock all the cupboards. However, he not happening at the time to be in bed, put himself in communication with various hotel and railway officials, packed me some stores and saw me off to the station in my rickshaw.

At the station of Shimbashi there did not seem to be any great excitement. I expected to find special trains laden with doctors, nurses and provisions, and all the regular traffic suspended. But there was merely the ordinary train waiting at the siding and into it were entraining farmers, workmen, clerks, and all the *οἱ πολλοι* of this democratic country, just as similar people do every night and morning at Liverpool Street. It is possible that the fact that there are 400 earthquakes a year in Yokohama has begotten some indifference to seismology in that city; or it may be that the citizens are better acquainted with the exuberances of their newspapers than I was, but I confess I was startled at this apathy. The yellow races are not great individualists and philanthropy is not strongly marked in their characters. I once saw a great famine in China in which some hundreds of people were dying daily; the administration viewed it with unconcern. It is obvious to any but Western intellects that the fewer mouths there are to feed the further what food there is will go: a rationale of famine administration which has not yet presented itself to our Indian

rulers. So, remembering this experience, my surprise was mitigated and I took my seat in the train. I was the only European in it, but no one embarrassed me with excessive civility on that account. On the contrary, I entered the least crowded carriage I could find, and after standing in the middle of it for a minute waiting for certain citizens to take their legs, feet and luggage off at least one of the available seats, pushed a number of boxes and baskets on to the floor and disposed my person amidst a chorus of snorts and grunts.

I had about a hundred miles to go to the north-east of the capital. The train jogged on from station to station at a pace which would have left a modern "leave" train from the Front to the Base standing still. In the evening, I got out at a station which sounded like the one I had booked to, though as the name of it was only displayed in Japanese, of which I did not know a character, I was rather uncertain. It was a little wayside station with a pretty mountainous country rolling round it. No one there could speak any English and all present gazed at me with undisguised amazement and amusement. As no one took any notice of my gestures, I picked up my bag and walked out of the station entrance; to get a move on of some sort seemed the first indication. I had been told in Yokohama that there was a large hotel near this village, a place that was open in the summer hot months for the resort of the wealthier people of the capital. My French landlord had given me a note to the proprietor of it. If I could only find it I felt that my troubles would be at an end. At first it looked as if I should have to wander about till I found it, but by good luck I then saw a very rickety rickshaw which evidently "met all trains" just trundling away from what it had grown used to looking on as a fruitless exercise. With a loud yell I hailed it and got in. I said not a word, for I thought it better to assume that the coolie would have sufficient brain power to guess at the only place an Englishman would want to go to, so I merely waved my hand up the road and he picking up the shafts trotted away.

The hotel was a big rambling place, a cross between the ordinary Japanese inn and an hotel on the European plan. It was closed at the time, but the landlord readily opened up a room for me. I could only get Japanese fare—eggs, fowls, and rice and some Japanese beer, but I made shift to do with these. I told him the object of my visit and he agreed to find me a guide and a pony for next day. The great smoking mountain was about twelve miles away and from my window I could see it with its great plume of steam and dust hanging hundreds of feet above it and drifting away into invisibility in the sky. So far as I could learn only three people had been killed. It was a desolate region. Though many valleys and hillsides were smothered in scrub and forest; there were great sable patches from which all life had been blasted by the rain of ashes and poisonous fumes. I had not been long at the inn before I discovered there was another European visitor. He joined me at dinner and I found he was a German,

an engineer, who lived in Tokio. He had come on the same mission as myself. He was a fine-looking man and a most agreeable companion. We agreed to join forces and "do" the mountain together the next day. Before daybreak we were in the courtyard where the ponies were waiting; they were tubby little beasts with harness much tied about with bits of string. The guide was there, a rough coolie man mounted on a pony with a sack for a saddle. We moved off at a jingling trot and followed track after track through open meadowland. By dawn we had entered the hills and crossed numbers of small headlong streams. Many of them were utilized for working small saw mills, the only evidence of industry there was to be seen. The whole region, indeed, was singularly unlike the rest of Japan I had seen, where the cultivation was so close that not one square foot was allowed to go waste. The hill scenery grew more and more sombre, deciduous trees presently giving way to conifers; the track, for I could call none of it road, wound constantly upward and seemed to grow more and more dusty. Vistas of enormous amplitude opened up before us through gaps in the hills and then again would be closed as we rounded some bend. The morning grew hot and we were soon pestered by myriads of flies. Some of these stung and were most venomous. At last we finished ascending and came out on a great upland plateau from which the volcano itself took its rise. There before us rose the monster smoking sullenly. The ground all round us was powdered with fine ashes. A better road, one evidently used for pack animal traffic, ran across the uplands. Beside it was a small booth in which two men were sitting. It appeared to fulfil the functions of an inn and we rested there awhile and drank beer. We left the three ponies there and struck off afoot towards the base of the cone. The evidences of the eruption now became more apparent. Everywhere the ground was deep in a black metallic-shining dust. Volcanic "bombs" from the size of a football to an arm-chair littered the ground in heaps, some fractured and showing the grey of the inner stone. Pine trees which here constituted most of the timber were smashed and broken. Torn boughs festooned the spaces between trunk and trunk. As we plodded through the thick choking dust two pheasants got up and flew off with a panic-stricken whirr. They were the only signs of life we saw except the flies. All through our long ride I had been aware of something missing in the landscape, something the lack of which gave it all a dead funereal aspect and made it seem as if no amount of sunshine and blue sky could make it joyous. It was bird-life that was lacking, Those who have not had a similar experience may find it hard to realize how such a want can detract from the finest scenery in the world. May it be long before intensive culture and the accursed bird "fanciers" have rendered our own country birdless.

The lower third of the mountain was torn in a terrible fashion by the action of the volcanic bombs. It looked as if it had sustained a prolonged bombardment by heavy artillery or been torn by the claws of rampaging

megatheria. One could easily believe on looking round that desolate region that one had come upon the last home of some of these extinct monsters. The mountain side to our left was prolonged into a mighty buttress by a stream of solidified lava ejected in some eruption of long ago. This huge expanse of black rock, on which nothing grew, was cracked and seamed by multitudinous fissures, and the heat of the day seemed to shimmer over it in nebulous circles of haze. This way and that the view ran for hundreds of miles from that elevation, for we were now well up the slope and the whole height of the mountain is 8,000 feet; but for lifelessness and a horrid frozen rigidity, we might well have been among the mountains of the moon. About half way up the ascent we were brought to a pause by a sudden terrible rumbling, followed by a hiss as of thousands of snakes flying through the air. At the same time we saw before us an enormous black plume uplift itself for several thousand feet above the mouth of the crater. There was something sublimely calm and majestic about it, as if the whole phenomenon was a thing apart that took no cognizance of mankind. The whole mass rose up impelled by an irresistible force beneath it, yet without any hurry or sudden shock of noise. Having reached its zenith, it began to unroll itself in the sky, and shortly afterwards a fine shiny dust began to patter down on us. Our guide was uneasy, and for myself, had I been alone, I should at this stage have deemed that I had seen enough. I think my friend the German was of the same way of thinking; but our two nationalities being as it were pitted, neither of us would be the first to turn back. I think we each read as much in the other's face, and so tacitly we began climbing again. The last third of the climb was terribly exhausting, for the ground was no ground at all, but a cushion of deep soft dust in which we went in nearly to the knees. The air was filled with fumes, often sulphurous and choking, which made our heads ache, and if it had not been for a cool breeze which we found blowing on our side of the cone, we should have been unable to continue. We did not find ourselves at once on the edge of the crater when we had reached the summit. All round us was an area of smashed and piled rocks, intermingled with huge fragments of asbestos. The latter looked like pieces of calcined honeycomb. They were of every size, some to be measured by the cubic yard, others by inches. Great areas were covered with a yellowish green deposit of sulphur. The rumbling of the volcano grew louder and more terrifying with every step. There was something horribly fascinating about it, though our nerves were on strings. The guide was muttering to himself under his breath. Had anything befallen, we should have had an aerial ride compared with which Elijah's would have been a mere circus performance. I could picture myself sailing over and into that valley 8,000 feet below, clinging to and revolving round several tons of rock with an excruciating interest in seeing which of us was going to fall uppermost.

We came at last to the lip of the crater and looked down into the pit of Tartarus. The crater was an almost clean oval with sheer wall-

like sides going down thousands of feet. From innumerable cracks and rents steam was rushing in thousands of hissing vortices, and for the most part the whole vast hollow was so filled with white vapour that nothing could be seen below. Ever and anon, however, there came a mighty poof! and the whole cloud of steam would lift, being driven over the tops of the walls into the air. We were driven back by the rush of gases, but immediately returned to the enthralling spectacle, holding our handkerchiefs before our mouths. Immediately after one of these explosions, the great funnel would be clear and there, hundreds or thousands of feet beneath us, was the blood-red boiling lava. We remained for some twenty minutes gazing on the fascinating spectacle. The noise was so great that we could not speak to one another; there was the roaring susurration of the steam, and on top of that there would come at intervals a deafening clanging noise as of thousands of rivets being driven into the iron walls of a ship or of untold iron rollers grinding one on another.

It may sound a foolish thing in cold blood to stand on the edge of such a convulsion; but the awfulness of the sight and noise, the feeling of prying into one of Nature's hidden forges, exercised a mesmerism that dwindled the proportions of fear and held us riveted in an absorption of their wonder. As it was growing late we made the quickest of our way down again, and reached our three ponies at the roadside inn.

I am sorry to relate that the mesmeric potency of this crater has proved too much for some people, and its fiery invitation has been answered more than once. A whole party of students committed suicide by flinging themselves into the gulf. In Japanese annals the mountain ranks as sacred and has pilgrimages paid to it still. The name of it is Asama-Yama, which may be found in any good map of Japan.

Current Literature.

Anopheles Plumbeus.—Blacklock and Carter who, in 1919, published a preliminary note on the "Experimental Infection in England, of *Anopheles plumbeus*, Hal., with *Plasmodium vivax*," have been pursuing their investigations and publish their results in two papers which form part of vol. xiii, No. 4 of the *Annals of Tropical Medicine and Parasitology* (Liverpool), March 15, 1920.

In the first paper they show that in the case of laboratory-bred *A. plumbeus* infection of gut and salivary glands was obtained at 20° C.; at room temperature (max. 26° C. and min. 17° C.) gut infection only was obtained. As regards *A. bifurcatus* experiments showed that "in England the native form of this mosquito is capable of being infected with malaria at 28° C."

The second paper describes "Observations on *Anopheles* (cœlodiazesis) *plumbeus*, Stephens, with special reference to its breeding places, occurrence in the Liverpool district, and possible connexion with the spread of malaria."

This paper describes the various species of trees and kind of holes in which

A. plumbeus lives and the authors consider that this mosquito hibernates in the larval form. They also hazard the suggestion that *A. plumbeus* may naturally act in England as a carrier of malaria infection.

Rats. Prevention and Extermination.—In a discussion following the reading of a paper by T. J. Kenny, M.R.C.V.S., on the above subject, at St. Helens, March 26, 1920, Captain J. Woolley (Lancashire County Council) brought up the following points:—

(1) Intensive rat destruction by areas was far more successful than fragmentary treatment by poisoning of scattered districts.

(2) Since the rat undoubtedly had a means of communicating with its fellows when anything unusual was afoot, it was essential that the whole of the poison baits should be laid by an advancing screen of men, in one direction, on the same day.

(3) Extract of squills and barium carbonate were the poisons most successfully used in Lancashire; these poisons were mixed with fresh bread and sweetened tinned milk.

(4) Approximately eighty-five per cent of the dead proved to be doe rats, and another interesting fact was that these dead rats were found on nests containing dead young.

(5) Rat campaigns should start prior to the season of migration to the country.

(6) The most effective trap used was the wire cage (Brailsford pattern), baited with raw tomato.

(7) Boy scouts should be interested in the subject, so that they might give useful economic service, and at the same time acquire a practical knowledge of the natural history of these rodents.

(8) During the absence of the rats on their summer holidays, and when their runs are "dulled," the return to their winter quarters should be barred by means of proofing with cement, broken glass and tar. At the time of the return of the rat, poison baits should be then laid near their old runs.

(9) Grain stacks can be protected by sheets of corrugated iron being sunk three feet below ground, and by a fine mesh wire surface fencing three feet high.

Scarlet Fever. (1) Hæmolytic Streptococci.—In the *Bulletin of the Johns Hopkins Hospital* for May, 1920, W. P. Bliss contributes a preliminary report entitled "A Biological Study of Hæmolytic Streptococci from the Throats of Patients Suffering from Scarlet Fever." He concludes:—

(1) In a study of 25 strains of *S. hæmolyticus* isolated from the throats of patients with scarlet fever, 20 or 80 per cent were agglutinated by four different anti-streptococcic sera made with streptococci isolated from scarlet fever cases.

(2) None of these strains were agglutinated by five anti-streptococcic sera of non-scarlatinal origin—except in a very few instances.

(3) But 3 of 17 strains of non-scarlatinal origin were agglutinated by these 3 sera of scarlatinal origin, and these 3 may have been either atypical scarlatinas or scarlatinal contacts.

(4) Certain differences in cultural characteristics, particularly in the formation of carbohydrates, were noted.

Von Pirquet Reaction.—In the May number of *Tubercle* is recorded a small investigation made by E. Bjorn-Hanson, in Norway.

An isolated hamlet, with sixty souls, and situated 400 metres above sea level, was the scene of the experiment. The hamlet lies secluded among mountains, and is surrounded by forests of spruce and birch; communication with the mother parish and the outside world generally is difficult and seldom carried

out. No death from tuberculosis is known to have ever occurred in the hamlet.

For the reaction, unmixed tuberculin (tbl. vetus) was used; the skin was cleansed with benzine, and two abrasions were made besides the control scarification. The reaction was carried out once in the case of each individual, and the results are tabulated below.

Age	Number examined	Reaction: Positive Total	Positive Percentage	Negative Total	Negative Percentage
0—15	17	0	0	17	100
16—25	10	4	40	6	60
26 - 35	7	5	71	2	29
36—45	6	5	83	1	17
46—55	4	3	75	1	25
Above 55	9	4	45	5	55
Total	53	21	40	32	60

The Science of Ventilation and Open-air Treatment.—The above is the title of a work by Leonard Hill and the first part published by the Medical Research Committee receives a very laudatory notice in *Tubercle* for March, 1920. The reviewer comments upon the entire absence of all reference to the old ideas concerning carbon dioxide in the atmosphere and notes that even the composition of the air finds no place.

The author rather dwells on the physical properties of the atmosphere and in particular: (*a*) its temperature; (*b*) its humidity; (*c*) its movements; "and has moved the whole question of ventilation from the field of respiratory interchange of gases to that of *skin reaction to atmospheric environment*." The instrument devised by Hill to indicate this reaction is called the Kata thermometer (described in the *Tubercle* notice): "there can be little doubt that this instrument is destined to be recognized as the most valuable we possess for testing the efficacy or the reverse of ventilation especially in public buildings, factories and workshops."

Hill's conclusions are that "the desirable atmosphere is characterized by being: (*a*) cool rather than hot; (*b*) dry rather than damp; (*c*) diverse in its temperature in different parts and at different times rather than uniform and monotonous; (*d*) moving rather than still.

Typhoid Fever: Carriers.—Dr. Lewis Lloyd publishes in the *Medical Officer* for February 7, 1920, an account of an enteric outbreak at Towyn, not far from Barmouth, which comprised twenty-three cases during the period 1909-18. Suspicion fastened on the milk supply from one particular farm. The four milkers were examined by Widal's test and two gave a positive reaction although neither was known to have suffered from enteric fever. The fæces and urine of the two postives were then examined for bacilli and these were found in one case.

Typhus Fever: (1) Epidemiology.—Gerard in *Thèses de Paris*, 1918-19, stated that the epidemic of typhus among Serbian soldiers at Bizerta in February-May, 1916, was mild and easily controlled. The mortality did not reach 9 per cent. On the other hand the Roumanian epidemic in Moldavia during January-June, 1917, was unusually severe and attended with a high mortality owing to the exigencies of an army in retreat and inclement weather. The mortality was particularly heavy among the intellectual classes and no less than 350 out of 1,500 medical officers in the Roumanian Army died of typhus.

The outbreak at Bizerta was a recrudescence of the disease, while the epidemic in Moldavia represented a first invasion of that country.

(2) **Ætiology.**—Rocha-Lima is opposed to the view of English and French writers that the louse remains a carrier of the typhus virus for twelve days only, and from experiments which he has conducted he is convinced that once affected a louse remains so throughout its life.

Mueller and Orizio have shown by experiment that typhus may be transmitted by the fæces alone of infected lice. During recent experiments both these observers accidentally pricked their fingers with the needle of the syringe containing the emulsion of fæces. "Seventeen days later Mueller developed a typical attack of typhus, but Orizio who had the disease a year previously escaped."

Reviews.

CLINICAL METHODS. By Robert Hutchison, M.D., F.R.C.P., and Harry Rainy, M.D., F.R.C.P.Ed., F.R.S.E. Seventh Edition. London: Messrs. Cassell and Co., Ltd. Price 12s. 6d.

The seventh edition of this book needs no introduction; it is a work with the contents of which no clinician can afford to be unfamiliar. The chief changes are found in the chapter on the circulatory system where some very instructive electrocardiographic tracings are introduced to illustrate various non-valvular cardiac disorders. In the chapter on the urine, Benedict's test for sugar has been added and the tests for acetone bodies revised; there is also included the estimation of diastase in the urine and the phenol-sulphone-phthalein test for renal efficiency. In this connexion one could wish to see further tests of renal function added as well as any of hepatic insufficiency.

In the chapter on clinical bacteriology one notes the description of Dreyer's standard method of agglutination, and in the Appendix, of Fontana's method of staining spirochætes. Of the new plates, No. 9, the blood in malaria, gives a clear picture of the chief features required in the diagnosis of the type of infection, whilst Nos. 14 and 15 illustrate respectively the fundus oculi and the tympanic membrane in health and disease.

Bearing in mind the scope of the book as laid down in the preface to the original edition, it is difficult to suggest any additions without trespassing on the domain of treatises on medical diagnosis. More detailed diagrams of the ascending and descending cerebrospinal tracts would assist in the application of clinical tests in nerve lesions, and after the description of the technique of obtaining samples for the Wassermann reaction might be added that of collecting capillary tube specimens of chancre exudates for transmission to a possibly distant laboratory.

ATLAS FOR ELECTRO-DIAGNOSIS AND THERAPEUTICS. By F. Miramond de Laroquette, M.D. Translated by Mary Gregson Cheetham. With foreword by Robert Knox, M.D. London: Baillière, Tindall and Cox. Pp. 180. Plates 69.

This little book, which is a translation from the French edition, can be strongly recommended to those taking up the subject of electro-therapeutics.

The great feature of the book is the way the subject matter has been grouped together under regions. Each muscle of a region has its origin and insertion, nerve supply, motor point and normal electrical reaction shown, so that at a

glance the memory can be refreshed and the condition of all muscles and nerves of a region rapidly worked out.

The table of normal coefficients of excitability of muscles and nerves is also valuable for ready reference.

We note that the old and new anatomical nomenclatures are used in a somewhat indiscriminate way and both can be seen on the description of one plate,

The plates, which are numerous, are well produced, but the value of all the old plates showing motor points is doubtful.

The subject of joints is treated in an interesting and novel way. Both the author and the translator are to be congratulated on the result of their work.

THE DOCTOR'S MANUAL OR PRACTITIONER'S VADE MECUM. By A. H. Hart, M.S. Fourth Editicn. John Bale, Sons and Danielsson, Ltd. 1920. Pp. xxxvi and 256. Price 10s. 6d. net.

Part I, which is an incorporation of "How to Cut the Drug Bill," will appeal to the general practitioner as a useful synopsis of the preparation of medicines and the dispensing of prescriptions.

Part II contains chapters on anæsthetics, antipyretics, antiseptic Spas and mineral waters, invalid foods and vaccine and serum therapy. The impression given by a perusal of some of these chapters is that they are of the nature of a journalistic puff on behalf of certain proprietary articles. Much useful information is given, but exception might be taken to the manner in which some of it is presented.

The author would have been well advised to have submitted Part III, Synopsis of Treatment, to a "ruthless revision." As it stands it is imperfect and in places out of date, and, indeed, is practically useless. The following terms are unintelligible—"Anti-vaccine serum," and "paratyphoid anti-serum, T.A.B."

A useful chapter on "Venereal Disease," is given by Mr. Frank Kidd in Part IV. Diagnosis and treatment so far as they lie within the province of the general practitioner are succinctly put.

Part V consists of an appendix of tables which are useful for ready reference.

J. C. K.

THE LINK BETWEEN THE PRACTITIONER AND THE LABORATORY. By C. Fletcher, M.B., B.S.Lond., and H. McLean, B.A., B.C.Cantab., D.P.H.Camb., M.R.C.S. Lewis and Co. 1920. Pp. 91. Price 4s. 6d. net.

This little book gives a concise synopsis of the assistance to be obtained from the laboratory in the diagnosis of disease. The diseases are arranged in alphabetical order, and under each the diagnostic points referable to the laboratory are enumerated. The remainder of the book is devoted to general directicns for the transmission of specimens, the method of collecting samples and specimens and a few notes on vaccines and sera.

The general practitioner, nowadays, cannot afford to neglect the opportunities afforded by the laboratory, but is apt to forget that the accuracy of laboratory diagnosis depends on the care and attention devoted to the collection and transmission of specimens. Thus the link between the practitioner and the pathologist is too often a weak one. This little book should help to strengthen it.

J. C. K.

Correspondence.

DYSENTERY STATISTICS: A REPLY TO DR. WENYON'S LETTER.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—In the June number of the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, Wenyon points out (p. 560) a source of error which it is important to take into consideration when dysentery statistics are being compiled chiefly from old, or convalescing cases dealt with in base hospitals. As I agree to a large extent with Wenyon's letter, I should not have troubled you with any comment upon it, if he had not used, as a text for his remarks as it were, a paper by myself on the relative proportions of amœbic and bacillary dysentery in the Egyptian Expeditionary Force (*vide* JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, February, 1920, p. 121). In so doing, he suggests that I myself overlooked the possible fallacy to which he refers.

May I say that I did not take the factor in question into account, because it did not call for consideration in connexion with the cases I analysed. My statistics did *not* relate to cases at the base "where a large proportion of the bacillary cases have ceased to be recognizable as bacillary dysentery, and the chance of isolating the organism is practically *nil*, while the amœbic cases, even if not showing actual blood and mucus dysentery, will still be harbouring recognizable *E. histolytica.*" On the contrary, as is clearly stated in my paper, my figures dealt *only with active cases, showing blood and mucus at the time*, on their way down the lines of communication. Cases with diarrhœa only, or with nearly normal stools, and the associated findings of precystic forms and cysts of *E. histolytica*, are omitted altogether from my table.

Again, Wenyon lays stress on the view that in bacillary dysentery "the chances of isolating the organism diminish rapidly after the first two days of the disease, while frequently"—and I understand he considers in the majority of cases—"the blood and mucus disappear also" in this short space of time. As regards this argument, not merely the positive isolation of organisms was taken into account by me; *all* the cases showing blood and mucus in which active *E. histolytica* were not found *were regarded as being bacillary dysentery*, quite apart from the question whether an organism was recovered from the stool or not; it was customary in the laboratory so to report them, and as such they are all included in my figures for the period concerned. It would have been better, perhaps, if I had specifically mentioned this point, and I am sorry if Wenyon has been misled for that reason. (I was considering the matter more particularly from the amœbic standpoint.) But I think it is clear to any one reading my paper carefully that this was intended; both from the percentages given in connexion with the numbers, and from the general trend of my remarks. At any rate, neither did the question of the difficulty of isolating the organism apply to my statistics. I submit, therefore, that in regard to the main causes to which the fallacy pointed out may be due, Wenyon had no reason whatever to refer to my paper as an illustration; on the contrary, indeed, I think that my figures were as little likely as those of any dysentary statistics published recently to be subject

to error in regard to the relative proportions, on account of the fallacy in question.

I may, perhaps, take this opportunity of adding that I think, in more than one instance of late, there has been a tendency to overestimate considerably the difficulty of isolating the specific organism, and the rapidity of disappearance of the blood and mucus, in bacillary dysentery. From my own experience, I should not say that the chance of isolating a dysenteric organism after the first two days is nearly so remote as Wenyon, for instance, implies, or that the blood and mucus disappear, in general, so soon. The former stands, of course, in close relation with the latter. As is well known, the difficulty of recovering the causal bacillus is greatly enhanced after the blood and mucus have ceased. Even in this case, however, success is by no means impossible; this is clearly seen, for example, from the recent valuable paper by Colonel Cowan and Captain Miller (*vide* JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, September, 1918, p. 228). But to restrict myself to the type of case under discussion, it can certainly be said, from the statistics obtained at Kantara alone, that, while blood and mucus persist, the chances do *not* so rapidly diminish. Thus, as stated in my paper, for the two months, August and September, my colleague, Captain G. Stuart, R.A.M.C., effected the isolation of the organism in forty-five per cent of these cases, or in 179 out of 400 stools. And these cases were nearly all from five to seven days old. Now, according to Manson-Bahr's figures (*vide* JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, August, 1919, p. 122), out of 342 plated stools—and it may be assumed these were selected ones, as fresh and promising as possible—"201 or 51·7 per cent" yielded specific bacilli. (Incidentally, either the number is too high, or else the percentage should be about fifty-nine; let me assume the latter). That is to say, from perfectly fresh cases, dysenteric bacilli were recovered in somewhat more than half, by an expert bacteriologist.[1] A percentage, therefore, of a little less than half, instead of one of somewhat over half, does not indicate, at any rate, a very rapid diminution of the chances of success in these cases, within a week. And had my colleague at Kantara been able to examine the negative cases even once again, on a succeeding day, his percentage would have been distinctly increased.

Although, therefore, my own experience does not support the above contention, I have asked my friend, Dr. Ledingham, for his opinion, as I think the question is one of considerable importance, upon which the view of someone much better qualified to speak than I am is desirable. Ledingham agrees that while the blood and mucus persist, the chances do not so rapidly diminish; he adds, that in his opinion, the chance of isolating the organism stands in direct relation with the presence of blood and mucus, and in inverse ralation with the treatment—whether specific or non-specific. In Mesopotamia, the best conditions for isolating *B. dysenteriæ* prevailed in Baghdad, and here it was possible to obtain

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[1] According to another paper, to which further reference is made below, Bahr and Young obtained the successful isolation in 78 per cent out of 107 cases, which were evidently part of the above-mentioned series of 342; but in the greater number, over the longer period, the percentage dropped as indicated. It must not be thought, of course, that I wish to minimize the extent of the assistance afforded by examination as early as possible; but it certainly does seem necessary to emphasize the fact that the difference between two days, and five to seven days, does not by any means signify the difference between success and failure, to a competent bacteriologist, using the customary precautions.

sixty per cent of success with cases arriving generally on the fourth, fifth, or sixth day of illness. Ledingham considers, however, if treatment of any kind (even mag. sulph.) has been given, the chance of isolating the organism is less, even though blood and mucus persist; a large proportion of the bacilli are probably washed out mechanically.

Further, I do *not* think it will be generally agreed that the blood and mucus, in bacillary dysentery, disappear in the minority of cases, in the course of a day or two. Neither to this view does Dr. Ledingham subscribe. In short, if one holds the above view of the transient duration of the characteristic symptoms and the rapid disappearance of the bacillus from the stool, in regard to the bulk of the cases, how is one to account for the numbers passing blood and mucus repeatedly which crowded, not only the base, but the home hospitals at certain periods during the war; and also for the quite respectable proportion of cases in which the organism was successfully isolated weeks after the attack began?

Naturally there *are* mild cases of bacillary dysentery, and in these the symptoms probably do disappear quickly. Such cases *were* probably missed at Kantara. That is the only reason for which, I admit, the *number* of bacillary cases reported by us was probably somewhat too low, relatively to the total number of stools examined. I considered this point at the time and came to the conclusion that it did not apply to my statistics, because *the relative proportions* of the two types, with which I was concerned, were not thereby affected. There are mild cases of amœbic dysentery, equally as of bacillary! And I have no doubt that, just as some—by no means all, of course—of the non-blood and mucus stools may have been from mild cases of bacillary dysentery, so others—especially certain of those in which precystic forms or cysts of *E. histolytica* were found—were from cases of definite amœbiasis, not showing at the moment any blood and mucus, but with just as much right to inclusion for statistical purposes as those of mild bacillary dysentery. It is obvious, bearing in mind the relative proportions of the two types, that only a small number of such cases would be required to balance the number of missed bacillaries.

Altogether, therefore, I maintain that the cases selected for my statistics represented a very fair average sample of the dysentery prevailing. And I still consider that my figures gave approximately an accurate estimate of the relative frequency of occurrence of the two types, for the season in question.

In the circumstances, I cannot refrain from mentioning a point which has only just come to my notice (otherwise, I should have referred to it in my paper). Bahr and Young, in a paper published (*vide* JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, April, 1919, p. 271), a few months before that in which the first-named author gives a "minimal" percentage (1.05) of amœbic dysentery for the season of 1917, state the results obtained in a field laboratory in Palestine during 1918, and write as follows: "In 1,874 cases, seven per cent were amœbic and ninety-three per cent bacillary, *which in our experience has been the proportion between these two diseases throughout the whole course of the campaign in the Egyptian Expeditionary Force*" (the italics are mine). That is to say, these authors there give, as their considered opinion, *the very identical proportions* which I myself obtained during the season of 1917! Is further comment needed?

I am, etc.,

Lister Institute, August, 27, 1920. H. M. WOODCOCK.

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OF THE

Royal Army Medical Corps

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COLONEL SIR WILLIAM H. HORROCKS, K.C.M.G., C.B.

ASSISTED BY

COLONEL D. HARVEY, C.M.G., C.B.E., R.A.M.C.

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Original Communications.

AN ACCOUNT OF SOME OLD BOOKS IN THE COLLEGE LIBRARY.

BY COLONEL CHARLES H. MELVILLE, C.M.G.
Army Medical Service (Retired Pay).

SOME months ago I was looking at some books which the librarian of the College was sorting and saw several which from their antiquity appeared to be of interest. It occurred to me that a notice of the more ancient of these might be not without interest to officers of the Royal Army Medical Corps, and accordingly, with the sanction of the Director-General, and of the Commandant of the College, I have ventured to write some description of the books, and their contents.

I cannot pretend to have carried my bibliographical research to any great depth, and the notes on the authors and their friends have been compiled chiefly from the National History of Biography, and Eloy's *Dictionnaire Historique de la Médecine Ancienne et Moderne.*

I have to thank the Librarian of the Royal Society of Medicine, and Dr. Thompson of the Wellcome Historical Medical Museum, for advice and assistance.

I.

PAMBOTANOLOGIA,[1] / SIVE / ENCHIRIDION BOTANICUM / OR A COMPLEAT / HERBALL, / Containing the Summe of Ancient and / Moderne Authors, both Galenical and Chy- / mical, touching Trees, Shrubs, Plants, Fruits / Flowers, &c. In an Alphabetical order : / wherein all that are not in the Phsyick Gar- / den at Oxford, are noted in Asterisks. / Showing their Place, Time, Names, / Kinds, Temperature, Vertues, Use, / Dose, Danger and Antidotes. / Together with / An / Introduction to Herbarisme, &c. / Appendix of Exoticks. / Universal Index of Plants : / shewing what

[1] In Greek Capitals.

grow wild in England. / The Second Edition, with many Additions mentioned at the end of the Preface. / By ROBERT LOVELL / *Philotheologiatronomos*.[1] / OXFORD : / Printed by W. H. for Ric. Davis. 1665.

Four blank pages : Title page (as above) : Pages numbered 3 to 84 ISAGOGE PHYTOLOGICA / OR, / An Introduction to / HERBARISME. / The actual herbal : pages numbered 1 to 672. Pages 673 and 674 omitted. Page 675 gives a list of errata. Catalogue of Books printed for and to be sold by Richard Davis, Oxon. Six pages unnumbered.

Robert Lovell was born at Lapworth, Warwickshire, about 1630, the younger son of Benjamin Lovell the Rector of that parish, and brother of Sir Salathiel Lovell a well-known lawyer. Studied at Christ Church College, Oxford. Returned to Coventry and had a fair practice there. Died 1690 and was buried in Holy Trinity, Coventry.

The first edition of his Pambotanologia was brought out in 1659, the second in 1665. There are copies of the first edition at the British Museum and College of Physicians Libraries, and the former has also the second edition, to which that in our library belongs.

Lovell also brought out a *Panzooryktologia*[1] in 1661.

He seems to have been a pedantical person as shown by the fact that he prints the main title of his works in the Greek character, and appends, in the same character, the terrible word *Theologiatronomos*[1] to his name. This epithet he must have been at pains to construct for himself apparently : it is not recognized by Liddell and Scott. As Dr. Johnson might have said, "Sir, it is not an epithet, it is an insult."

The actual Herbal itself is a careful piece of work, and evidently represents a tremendous amount of reading. The language is clear, and to the point, however erroneous that point may seem to be to us now.

It is much otherwise with his introduction, or *Isagoge Phytologica*. This begins hopefully (from the reader's point of view) as follows : "Courteous Reader, Avoiding the Perplexity and tediousness of a Proemial Discourse (brevity being here intended) thou mayest first consider the *Quid sit* of Phytologie." Thereupon ensues upwards of eighty pages of intolerable verbiage. The introduction is divided and sub-divided into heads, like the firstly, secondly, etc., of an old Scots sermon. The headings are mainly almost unintelligible words constructed from Greek. A few samples may suffice—Araiotick, Ryptic, Leptyntic, Bechick, Alloiosilogy, Pepeirology, Protergasiology, Dropologie (which has no connexion with drops), Chresiologie. He mercifully gives the real meaning in each case : and having got this it is still no easy matter to be sure of the etymology, even with the aid of Messrs. Liddell and Scott. They are as follows : Rarefying, Cleansing, Attenuating, Helping the cough, Disposition, Age, Operations of the first four qualities, Manner of gathering, Use. Several pages are given up to a consideration of Astrology, the connexions between Planets and Con-

[1] In Greek Characters.

stellations on the one hand, and Diseases and Vegetable Remedies on the other.

In one particular Lovell is merciful. He gives the vernacular instead of the scientific names of the plants; the country expressions have the feeling of a breath of fresh air on coming out of a stuffy lecture room after the horrible nomenclature of the Isagoge.

The list of authors referred to by Lovell in the course of his work contains more than 250 names. The mere labour of collecting references must have been enormous in those days. It is hardly likely that he possessed copies of all these in his own library, or that any were available in Coventry, or indeed any nearer than at Oxford. One can only regret with Pulteney in his "Sketches of the Progress of Botany," "the misapplication of talents which demonstrate an extensive knowledge of books, a wonderful industry in the collection of his materials and not less judgment in arrangement." Sir Salathiel Lovell, Robert's elder brother, merits at least a line. He died at the age of 95, having been appointed fifth Baron of the Exchequer at the age of 90. He appears to have been distinguished mostly by his want of memory, and his title of Recorder was changed by the wits to Obliviscor of London.

II.

AROMATUM / ET / SIMPLICIUM ALIQUOT / MEDICAMENTORUM APUD/INDOS NASCENTIUM/HISTORIA:/Primum quidem in Lusitanica lingua per Dialogos conscripta, a D. GARCIA AB HORTO/ Proregis Indiae Medico / Deinde Latino Sermone in Epitomen contracta et icon-/ibus ad vivum expressis, locupletioribus, annotatiun-/culis illustrata a CAROLO CLUSIO Atrebate./Tertia Editio/ANTVERPIAE/Ex officina Christophori Plantini/Architypographi Regii/cIↄ. Iↄ, LXXIX.

On reverse of title page is a "Summa Privilegii" from Philip, King of Spain (Philip II) and Duke of Brabant, forbidding anyone, without the sanction of Christopher Plantin, and for the space of four years, to print, or import, or expose for sale, a copy of this book.

Pages numbered to 217 (including title page) followed by six pages of index unnumbered.

Carolus Clusius, the author, was born in 1526 at Arras. Studied at Louvain and elsewhere, and finally at Montpelier, where he came under the influence of Guillaume Rondelet: was converted by Melancthon, and became an ardent Protestant: suffered persecution and lost several relatives by martyrdom. Having been deprived of his property he led a nomad life, working as a literary hack, and as a private tutor, under the patronage of Dodoens, Rondelet and Plantin. He was in England in 1581 and 1582, and there met Sir Francis Drake, with whom and other members of his family, and also with other companions of his great voyage, Clusius seems to have become fairly intimate. He acknowledges his indebtedness to these

for information on botanical matters, acquired during their voyages. He had a good knowledge of science as known in those days, and his wandering career made him a good linguist.

His chief bent was, however, in the direction of botany and horticulture. The Princesse de Chimay called him "*père de tous les beaux jardins de ce pays.*" More usefully still he introduced the potato into Germany and Austria. According to Cuvier, Clusius added 600 to the number of known plants, and did not, as was common in those days, confine his attention to flowering species only. There are eighty water-colour drawings of fungi in the library of the University at Leyden, drawn under his direction, to the order of Count Balthasar of Batthyany.

A word may also be said here of the publisher of this book. Christopher Plantin was born in 1514 and studied the art of printing in Touraine. He migrated later to Antwerp, in 1550, and after trying to make a livelihood at bookbinding, took to printing and publishing. He was himself a well-read man, and evidently had large and generous ideas. The publishing business passed, with his daughter, to his chief assistant, but continued under the name of the *Maison Plantin* till 1876. The old house, which had remained almost unchanged, was then converted into the Musée Plantin, which still exists.

Garcias ab Orto (sometimes referred to as de Horto) was a Portuguese, and studied at Lisbon in 1534. He became first medical officer to the Count de Redondo, Viceroy of the Indies. Whilst in India he took up the study of botany, both at Goa and in Bombay, where he had a garden, in which he cultivated rare trees. He published his memoirs, under the title *Colloquios dos simples o drogas da India*, in quarto, in 1563. These were translated into Italian, French and English. The present volume is an abbreviation, and adaptation, of the original.

On the title-page of the book, some previous owner, probably the first, has written "*In manib, Domini fortis meae* 11 July 1585."

The book opens with the usual letter addressed "*Benevolo Lectori*" detailing the circumstances under which Clusius undertook the translation of the work from the Spanish (in which Garcias, "*amicorum efflagitationibus victus*," had originally written it) into the more generally familiar Latin of the time. In addition he epitomized the work, rejecting what seemed to him irrelevant matter. Garcias had apparently written his work in the form of a dialogue, entailing a good deal of repetition, and Clusius rejected this form of presentation, not unwisely. He also added notes of his own, taken from his own experience, and the writings of other authors, principally Avicenna. The introductory epistle concludes with a short elegiac copy of verses, three couplets, written by a certain "Joan. Posthius Germ. Med." in praise of Garcias as the original writer, and Clusius as the translator, prophesying that their fame will last as long as India sends us drugs from her fertile fields. Probably the introduction of tar-derivatives is the cause why their fame has not lasted as long as the worthy John

evidently expected. As to the book itself it is impossible to speak too highly. I have read it from cover to cover with the greatest enjoyment, and can compare it only to Herodotus, for clearness of style, and variety of information, not omitting those delightful digressions into side issues which characterize the old Greek.

As for his style I will quote his description of the symptoms of cholera, a model of clear and accurate statement. "Pulse weak and thready (*concisus*) respiration difficult; externally a cold sweat, but internally burning heat, and thirst, eyes almost closed, sleeplessness tortures the patient, frequent vomiting and passage of motions, until at length the expulsive powers altogether fail, and there follow cramps and tenseness of the muscles." His treatment also is not unreasonable. He begins with an emetic, a common practice not so very long ago, and washes out the lower bowel with an emollient clyster, rubs the body all over and anoints with warm oil. For nourishment he orders chicken broth, from which the fat has been removed. He mentions the native form of treatment: Internally a watery decoction of rice with pepper and cummin, the application of the cautery to the feet, and of pepper to the eyes. The cramps were dealt with by tight bandaging of the arms and legs.

As a specimen of his digressions, the following is typical. A certain person of the name of Gerard had made some statement about the correct name of a plant, with which statement our author disagrees. He remarks that this fellow (he calls him "*aliquis*") did not know Arabic, and then goes on to say that the true Arabic, in which Avicenna wrote, is spoken by the Syrians, Mesopotamians, Persians and Tartars "amongst whom Avicenna is believed to have been born, at Bussora (which some people think to be Babylon, but I have ascertained that it is not Babylon, of which no remains now exist, but only in the vicinity thereof)." He places Bussora in the Uzbeg province, which leads to a few words about the Uzbegs, their strength and skill in archery, and a conjecture that they are identical with the Parthians who gave so much trouble to the Romans. Then back to the Arabic language, and the variety of it spoken by the Moors, called "Magaraby" of which he gives the etymology. All of which supplies a pleasant interlude in a lengthy discourse on the nature, virtues and uses of asa-fœtida, in the Arabic tongue, *Altiht*. As regards the uses of this fragrant plant, he gives the following interesting detail. "The Indians are in the habit of placing it in hollow teeth, as a cure for toothache, which property is also attributed to it by Dioscorides, lib. 3, cap. 76, although Pliny, lib. 22, cap. 23, thinks otherwise, by reason of the case of a man who after thus using it threw himself from a precipice. But it is possible that the patient suffered from cachexia, and the drug acted too violently on the humours which were involved in this complaint." This extract is illustrative of another peculiarity (or rather characteristic, for our author is not peculiar in the matter) which is the great reliance still reposed at that time (A.D. 1579) on the classical writers. The date

of Dioscorides is about A.D. 100, that of Pliny somewhat earlier. A millenium and a half is about as close to immortality, as most writers are likely to attain. In addition to the above, Galen, Rhases, and Avicenna, are the authorities most often quoted.

Some of the digressions are of more importance than those above given, in particular some which refer to the introduction of Syphilis into Europe. The reference is in connexion with the description of a root termed Radix Chinæ, and is worth detailing at some length. (This plant also called Tuber Chinæ, and American China Root, is a species of smilax and a native of Japan and China, as well as some eastern islands; it occurs also in Assam, Sikkim and Nepal. In India and China it is still held in repute for the relief of rheumatic and syphilitic complaints, and as an aphrodisiac. According to Polak the tubers are consumed by Turcomans and Mongols as food. The root acquired a celebrity in Europe, in consequence of its having been used in the treatment of the gout from which the Emperor Charles V suffered, and was much used at the end of the seventeenth century as an alterative and sudorific.)

"This root grows in the extensive region of China, which is believed to extend as far as Muscovy. Through practically the whole of this province, and also in Japan, the *lues venerea* rages: which disease some call the Neopolitan sickness, others the French, we the Spanish itch, the Persians *Bade-Frangi* (or even in brief *Fringui*), which means French sickness: therefore the Almighty has revealed to the inhabitants of this country the use of a root which grows amongst them, and can give them help in this ailment. In the same way in the New World he revealed the use of Guaiacum since that part of the world has been infected with this disease, beyond all memory of man. The Spaniards contracting the illness there, brought it into Europe in the year of man's salvation 1493. The use of this root began to be known to us after the year 1535, being brought here (sc. Goa) by certain Chinese, who were infected by the disease, and cured themselves by its use, during their stay with us." He proceeds to relate that up till that time Guaiacum was the drug in ordinary use, but owing to a failure in the supply from Portugal, the China root was adopted instead. The drug came into great favour since it was not necessary to observe, whilst going through the prescribed course of treatment, the strict regimen appointed for those under Guaiacum. "Add to this," he says, "that the inhabitants of this country owing to their indolent habits are great gluttons, . . . From that time Guaiacum fell into disrepute, and was abandoned in India, except in the case of a certain Spaniard who desired to kill the natives with starvation." There was just about this time no love lost between the Spaniards and Portuguese, and doubtless the last remark had a certain national bias behind it. He gives a full account of the method of administration, and remarks that the drug is particularly useful in obstinate cases with large tumours and malignant ulcers (? gummata and nodes). He adds a useful hint, which had perhaps

be better left in its original Latin. "*Intelligo eos qui hoc decocto utuntur, mulierum conspectu vehementer ad libidinem accendi. Quare consultum videtur, ut per curae tempus nullae ad aegros mulieres admittantur.*" A precaution not inadvisable on other grounds than those which he gives. He winds up his account of the China root with one of his usual Herodotean digressions, as follows: "Since in these commentaries I shall frequently have to refer to the Chinese it will not be contrary to the scheme of my work if I insert under this head a few items of information which I have acquired concerning them, from trustworthy individuals. The Chinese, then, are Asiatic Scythians, who although they are considered a race of barbarians, are nevertheless remarkably active both in trade and in manufactures. Neither do they yield in repute to any other race in the matter of literary knowledge. They have a written code of laws closely resembling those of the Empire, as can be seen from a copy of their laws which is preserved by the Indians. One of these I may quote for an example: It is not allowed for a man to marry a woman, after the death of her husband, if he have committed adultery with her during the lifetime of the husband. I understand that among them rank and rewards are distributed according to learning: the control of the throne, and of the whole kingdom is indeed in the hands of learned men. The art of printing is so ancient amongst them that the memory of man goeth not to the contrary, and they believe that it has always been in use amongst them." Clusius adds a footnote to the chapter saying that the use of the China root had by the time of translation been quite superseded by that of sarsaparilla.

I have spent so much time and space on the China root that I can only just touch on one more point, and that is a delightful account of the mongcose and the manner in which it fights the cobra, which comes in apropos to a description of "*Lignum Colubrinum.*" "In the island of Ceylon there is a serpent distinguished by a diadem, called the *Cobra de Capello*, very poisonous. There is in addition an animal the size of a ferret called *Quil* or *Quirpele*, very hostile to this snake. Whenever this little beast meets with the snake it bites off a piece of this root, which projects above the ground. Having done this it spits on its fore-paws; then rubs first its head and, after, the rest of its body with the saliva: it then attacks the serpent, and holding on to it, firmly, kills it. If at the first attack it is unable to overcome the snake it has again recourse to the root, rubs itself against it and returns to the combat, and thus slays the serpent with its teeth. The Cingalese (that is the inhabitants of Ceylon) have learnt from this spectacle that this root is an antidote to the snake's venom. Encounters of this kind have been seen by many of the Portuguese, for they are accustomed to keep animals like this as pets in their houses, in the first place to kill mice, which they hunt very keenly, and also to fight with Cobras which strolling beggars, called 'Iogues' bring round. These men cover themselves with ashes, and pass them-

selves off to the vulgar as objects of veneration. Some of them carry about cobras which they have deprived of their fangs, so that they are harmless, and these they stroke and place round their necks pretending to the vulgar that they have tamed them by incantations." In this respect at least India has changed but little. Our author's love for digression also leads him from his prime subject of spices to say a few words about precious stones, excusing himself on the grounds that he has already wandered as far as to speak of that mysterious stone, found in the stomachs of certain goats, called "Bezar." He dwells mostly on the Diamond. He states that the native physicians are in the habit of injecting it into the bladder to break up calculi, an expensive method of lithotrity. The internal use of this stone has, he says, been discontinued, owing to an ignorant apprehension on the part of the vulgar that owing to its penetrating power it might cause perforation, "an opinion shared of late by certain medical men. But the idea is absurd (*vana est persuasio*). For I have known the negro slaves of jewellers to swallow diamonds, and to confess after having been soundly thrashed that they had done so. The stones have later passed out with the excrement, without doing any harm. This I can testify to." He is also very sceptical as to the efficacy of pounded diamonds as a mechanical poison. On the subject of diamonds Clusius adds a footnote to the effect that they had been found in the Severn three miles above Bristol, some of which had been given him by a person described as "Dn. Georgius Norgius Northum."

He mentions, only to reject, the fable that ships of Calicut are built with wooden instead of iron nails, for fear that the latter might be drawn out of the ship by the attraction of Magnetic Mountains, as indeed occurred I have always understood to Sinbad on one of his voyages. There is an interesting chapter, "*De quibusdam Indiae Regibus*," giving a short review of the history of India. The transliteration of names renders this somewhat difficult to understand. Rajputs is written "Reisbuti": Shah Alum is represented by "Xa-holam."

The book is illustrated by excellently executed woodcuts, twenty-seven in number.

III.

Three years later Clusius brought out an additional volume, entitled CAROLI/CLUSII ATREB./ALIQUOT NOTAE/IN/GARCIAE/Aromatum Historiam/Ejusdem/Descriptiones nonnullarum Stirpium, & aliarum/ exoticarum rerum, quae a Generoso viro FRAN-/CISCO DRAKE Equite Anglo,& his observatae/sunt, qui eum in longa illa Navigatione, qua/proximis annis universum orbem circumivit,/comitati sunt: & quorundam peregrinorum/fructuum quos Londini ab amicis accepit/. ANTVERPIAE/Ex/ officina Christophori Plantini, M.D.LXXXII. Pages numbered to 43 including title page. Three blank pages at end. On reverse of forty-

third page, appears: ANTVERPIAE/EXCUDEBAT CHISTOPHO-/RUS PLANTINUS, ARCHI-TYPOGRAPHUS, ANNO cIↃ. IↃ. LXXXII. MENSE FEB. 15 woodcuts.

On title page of this book, and also of the previous one, there is a small inset cut showing a hand with compasses proceeding from a cloud, and describing a circle on a flat surface. The words "LABORE ET CONSTANTIA" are inscribed on an encircling band, with a slight floral decoration.

This supplementary volume opens with an introductory letter addressed to the Illustrious and Magnificent Lord Balthasar de Batthyan, hereditary chief of the Royal Dapifers in Hungary, etc., as follows:—

"I presume that your Magnificence has heard that a noble Englishman has in these three years circumnavigated the entire globe; for the fame of his return was spread everywhere. That fame induced me last year when I was in England to effect a certain acquaintanceship with those who accompanied him, desiring to learn somewhat of the things, which they had observed in their long voyage: and not only was this brought about by the efforts of some of my friends, but in addition I obtained access to their leader Sir Francis Drake who in the kindest manner communicated many things to me. Many things also very pleasant to hear I learnt from a certain gentleman of the name of Eliot who was of his company, and also other members of the Drake family: but especially grateful were those things appertaining to Botany which I learnt from them."

The information in the book is chiefly botanical. There is an interesting account of the Cacao bean, and of the "grateful and comforting" beverage made from it. I do not think however that Clusius would have been asked to furnish advertisement material for that substance at the present day. This is what he says:—

"When about to make a beverage from the bean they dry it before a fire in an earthenware vessel. It is then broken up by means of the grindstones which are used for making bread, and poured into dishes, made out of a sort of cucumber which grows throughout the Indies. The crushed bean is then slowly mixed with water, and after being flavoured with a little pepper, is ready for consumption. It more resembles hogwash than a drink fit for human beings. During my wanderings in that country for over a year I shuddered at having to drink such filth. But when the time came that I had run short of wine, to avoid having to drink nothing but water I learnt to imitate others. The stuff has a somewhat bitter taste, refreshes the body and produces a sense of satiety, and is in addition slightly intoxicating. It is the chiefest and most expensive article of commerce in those parts, nor do the Indians esteem anything above it. Thus far Benzo." (This is the name of Clusius' informant, a soldier who had served many years in the various provinces of the Indies.) Clusius himself adds that the stuff has a bitter and unpleasant taste "and I do not at all wonder that those who have tasted it, at first

shrink with disgust from the beverage manufactured from it. Personally I would much prefer pure water."

Amongst the companions of Drake that Clusius mentions is William Winter, who he states was the commander of the ship that turned back at the Straits of Magellan. Readers of "Westward Ho!" will remember the abuse that the hero, Amyas Leigh, pours on the head of this gentleman. According to the "History of National Biography" both Clusius and Kingsley have mistaken their man. The renegade was not William Winter but John, his son. William commanded the fleet outside Smerwick in 1580 and is supposed to be the man who originated the idea of sending in fireships against the Armada on the 28th July, 1588.

(*To be continued.*)

AT THE DOOR OF OPPORTUNITY.

By Colonel Sir ROBERT FIRTH, K.B.E., C.B.
Army Medical Service (Retired Pay).

As President of the Section,[1] it is my duty to conform to custom and give an opening address. On what subject to speak has been a matter of anxiety to me. I have looked through the addresses of some of my predecessors and find that no one of them has been able to take advantage of the occasion and expound some new and epoch-making theory or announcement, but rather they have confined themselves to generalities. Much as I would like to have been in a position to break away and tell you something new, facts are too strong for me and I am forced to conform to precedent and to speak rather of the general than the particular. That I do so, I ask rather for your sympathy than for your criticism. Having thus expressed my weakness, I make the further confession that, having no axe of my own to grind, I speak as the detached man. Pardon me for reminding you what a rare and precious gift is the art of detachment. It is the gift by which a man may so separate himself from a life-long environment as to take a panoramic view of the conditions under which he has moved and lived, or of the subject in which he has been most identified and interested; in other words, it is that gift which frees us sufficiently to see the realities as they are, the shadows as they appear. Now, I do not claim to have gained the precious art of detachment, but I have striven for it and, so far as I have been successful in respect of preventive medicine, I would lay bare to you my thoughts on some aspects of that subject to which this Section is specially appropriated.

As might be expected, I find some changes after an absence of years, and it is not very easy to pick up dropped threads and re-orientate myself. I have the feeling that we have been like travellers in a mist, and that now, as we issue from that mist and take our bearings on a new horizon, we find ourselves happily not far out from our reckoning: perhaps, still far from the summits which are our goal, yet we have reached a rise in the ground whence we can get a good view of the country before us. To a large extent, we have journeyed so far only by half-conscious instincts, but now, I think, we have a legitimate hope to go forward in the light and discretion of reason. I mean by this that we have shed some misconceptions and have a good chance of advancing on better lines. Of misconceptions cast aside, I would mention the notion that disease is an entity and a thing to be opposed or frustrated much as the occupants of a stockade would attempt to exclude a would-be intruder. As you all know, we take

[1] Address delivered as President of Section on Preventive Medicine, at the Congress of the Royal Sanitary Institute at Birmingham on July 20, 1920. Printed in this Journal with the kind permission of the Council of the Royal Sanitary Institute.

another view now as to the nature of disease. Another misconception I gladly see to have been jettisoned is the view of preventive medicine which restricted its scope to environmental questions and the amenities of external sanitation. In the field of administration I find most of the old cumbersome anomalies, leading to confusion and overlapping, to be still existing but the formation of a Ministry of Health promises well for simplification and unification in respect of such questions as general sanitation, housing, epidemiology, infectious diseases, maternity, infant welfare, health insurance, tuberculosis and venereal diseases, with co-ordination of the hygienic activities of other departments such as the Board of Education for the school child, the Home Office for industrial hygiene, and the Board of Agriculture for food control.

In this way, preventive medicine as the chief handmaiden of the new humanity enters on a new stage. On this advance and prospect we rightly congratulate ourselves but, before developing my theme, I am sufficiently old-fashioned to enter the plea for grateful thanks to those who have gone before and prepared the way. In this homage, I recall to your memories the names of John Howard, John Pringle, Robert Owen, Lord Shaftesbury, Edwin Chadwick, Benjamin Hall, Edmund Parkes, Francois de Chaumont, John Simon, George Buchanan, Farr, Seaton, Netten-Radcliffe, Ballard, Thorne Thorne, and many others. To many of this generation I fear these names are little known, but those who are familiar with the evolution of what we call preventive medicine will appreciate the significance of this nominal roll. Who knows but that this "circle of the wise" may still look down on us and see the gatherings in which they play no part and in which too often their names are neither invoked nor blessed. I would repair the omission and say that ours is the loss, since to us, distant in humanity, the need is ever present to cherish the memories of the men who in days of trial and hardship laid the foundations of the present structure on which we pride ourselves.

Whatever may be our justification for self-congratulation, it is necessary that, as regards the present and the future, we do not lose our sense of perspective, that we recognize our weakness as well as our strength, our limitations as well as our possibilities. The astonishing victories gained during the last fifty years by preventive medicine are known to you all. Vast sections of the population live healthy lives; at all ages there has been a reduction in the death-rate; the expectation of life at birth has risen in the case of males from 41 to 51 years and in that of females from 44 to 55 years; the infant mortality rate is well below the ten per cent line; we suffer a relatively light burden from some epidemic and infectious diseases and many gross forms of disease have practically disappeared, while whole groups of tropical disease have come or are coming under control. On the other hand, we have a steadily falling birth-rate, a still unnecessary loss of life in infancy and before birth, nearly 100,000 fresh cases of tuberculosis occur annually, a similar number of diphtheria and

scarlet fever cases and upwards of a million cases of measles each year. Further, one-sixth of the children of school age are so dull and backward mentally as to be unable to derive reasonable benefit from schooling, half of the school children are in need of dental treatment and one-twelfth of the children are so defective in eyesight as to be unable to take reasonable advantage of their lessons. The expenditure on sickness and disablement benefit returns under the system of national insurance denote that more than half of these people claim and receive treatment representing an aggregate loss of working time equal to many thousands of years per annum and most of which was due to what should be preventable sickness. Similarly, a recent Report on the physical examination of over 2½ million men of military age shows that only thirty-six per cent of them were of normal health and strength and that of the remainder nearly forty per cent were of a very low physical grade. These imperfections in the national health balance sheet coupled with our demonstrated helplessness when an epidemic like influenza sweeps through the world and claims 100,000 deaths amongst us, as it did less than two years ago, gives food for thought and the realization that we still have much to learn and much to do.

This evidence of weak points in our national health balance sheet is all the more striking when we recall our potential capacity to control disease among large masses of soldiers in the late war. The success achieved in the war area and various military communities was undoubtedly of a high order and particularly gratifying to me as one who had been for many years an evangelist of the goddess Hygeia in the army. However, I am reluctant to lay much stress on the facts because the hygienic administration of disciplined groups is easier than the corresponding administration of a general community. We in the army were fortunate to possess a disciplined population and a perfected organization which permitted of action for the community as easily as for the individual. Moreover, I am not unmindful of the fact that the army sanitary organization received the valuable help of some of the most capable sanitarians from the civil side. If there is one lesson more than another to be derived from our war experiences, it is the value of laboratory work as applied to the prevention of disease and the efficacy of simple materials and simple methods used in an intelligent way. To go further than this seems to me to be unwise.

Notwithstanding some large items on the wrong side of the national health balance sheet, I take an optimistic view of the future of preventive medicine but, as an onlooker, I cannot conceal from myself that there are weak points. It is too early yet to see the effects of the newly formed Ministry of Health, and, judging by its utterances, its actions promise to be based on sound and comprehensive principles. I welcome it as a great advance and the harbinger of great things to come, if only as a co-ordinator, director, developer and unifier of forces which hitherto have overlapped or worked independently of each other. I foresee that it will be more than

that, but the problem which it faces is complex to a degree and the measure of its success will be judged by its organization of an ordered and systematic attack on the strongholds of preventable disease, particularly that mass of crippled invalidism which is steadily undermining the capacity and efficiency of the masses. The essential partners in this attack are the public and the profession of medicine, or, what is the same thing, the health of the community depends mainly on three factors: namely, the good mother, the good general practitioner and the good health officer.

As affecting the public, the outstanding needs at the present time are the dissemination of knowledge among the people so that they may know how to secure and preserve personal health, coupled with measures to ensure that the masses exist under such industrial and domiciliary conditions that their knowledge may be put into practice. In this, as in other spheres of human activity, ignorance is the chief danger. It is not too much to say that in proportion as knowledge spreads in a population, disease and incapacity decline. As in the individual so in the community, knowledge is the sheet anchor of preventive medicine, knowledge of the way of health, knowledge of the causes and channels of disease, knowledge of remedy. That great and far-reaching efforts have been made and are being made to enlighten public opinion on the theory and practice of hygiene is well known to us all, and the progress made is encouraging for even greater efforts. But, in respect of domiciliary conditions we have much lee-way to make up. It is familiar to us in the great housing problem of to-day. Some aspects of this question will be discussed in other sections of this Congress, and it is inappropriate for me to enlarge on the subject, but I am tempted to say this much: Who is there here who is not familiar with the beauty of some parts of certain old English towns? And who can deny that our houses were beautiful when the nation was relatively poor and are horribly ugly now when the nation is relatively rich? Squalor and ugliness threaten to overwhelm us under the mistakes of the past and yet beauty beckons to us among the promises of the future. I often wonder whether the powers that be in these matters have any policy; if not, is it too much to ask that a policy be thought out? We need and must have beautiful towns and cities, but, at the same time, we must do away with the disfigurement and destruction of the rural belts surrounding them. The garden city is the product of a confusion of ideas and gives us but innumerable doll's house plots and a series of pocket squares of mown grass. The truth is, the town or city belongs to the commerce of men and should be concentrated. For the sake of the country and for all it can do towards feeding us let us cease to sprawl over it with our houses, and still more for the sake of our towns let us develop them intensively. There is room in this city to house four times the existing population, while arranging for open spaces eight times their present extent. Let us prescribe limits for our towns and draw lines of circumference around them in the future.

And as for our future industrial expansion, the ideal is that it be rural.

The human case for it is overwhelming while modern transport and the electrical transmission of power make it feasible. In place of so-called garden cities, I would prefer to see industrial villages whence the factory worker could reach and be a real sharer of the true country, where, in his spare time, he could be a producer from the soil instead of a consumer of cheap luxuries in a town. Meanwhile, our towns themselves should contract in place of expanding, and should rise instead of spreading. In this conception, I do not visualize new monstrosities heralding a new gloom but reasonable development whereby height, by economizing space, might be made to give ample housing accommodation in conjunction with increased facilities for the ordered and open life of the dwellers in the community. Neither do I favour the building of huge sky-scraping tenement dwellings, nor am I unmindful of the value of one home, one family and one garden for all. But we must be practical and realize that all which is desirable is not necessarily possible, and that for the sake of the greater number we must safeguard our rural areas by concentrating our towns. If we continue to go on in the future as we have done in the past, there will be no rural areas left to us. In thus referring to the housing problem, I plead for some clear thinking, before it is too late. Let us avoid the mistakes of the past and think out what we really want, but, above all things, let us prevent the next generation being forced to realize that they can never have wanted what they have got. Unless I misread the signs and the words of legislators, it seems to me that the inhabitant of our future town or city is doomed to the listless contemplation of his own and his neighbour's insignificance; he will have the benefit neither of country nor of town. I hope that I am wrong.

Now, as to the other partner. Although, there are many forces inimical to the State and to the public health which lie outside the province of medicine, still the driving force behind any Minister of Health must be and will be the profession of medicine, but, true as this may be, we must not forget that the power of that force and the readiness of the community to accept its guidance will depend upon the degree of confidence which the profession can inspire both as to its knowledge and the methods of applying that knowledge to the general good. That being so, the question is, where do we fail and what are the weak points? We are all agreed that disease is a failure or discord in the interplay of the various factors which go to make up the physiological drama of man's body and the economico-social drama of his life as a citizen. Health is the dynamic balance of those factors and ill-health or disease the discord or failure of the correct reciprocal interplay of the factors involved. It follows then that the first adventure of disease prevention must be to search for and investigate the origins of disease. The pertinent question suggests itself here: is the search to begin at the larger disturbances of the reciprocal interplay of factors or is it to be at the minor and incipient variations? If we think for a moment of how the sources of great rivers have been discovered, we

find that the best results have followed the systematic working up of streams and to me it seems that on a similar method of tracking back from the main branches of disease, noting stages, unravelling complications and comparing their features and directions in men, animals and plants, we are more likely to find their several origins than by studying only the areas where they are less differentiated.

Adopting this view, it is obvious that the problems of preventive medicine arise where the individual citizen lives, that his home and workplace are the fields for inquiry. For this reason the general practitioner is or should be the real fighting man of the cohorts of Hygeia, and much will depend upon how well he can carry out partly or wholly the investigations which are necessary. The elucidation of the early signs of disease as presented by casual symptoms, and a right understanding of the law of associated phenomena alone offer a vast field of work for the general practitoner, to say nothing of a whole string of diseased conditions which I need not enumerate. Besides, there is other work open to him. Our present classification of disease is based upon what we find in the dead, and the idea prevails that ailments can be classified according to gross structural changes. Many persons are ill with no structural changes, their only signs of disease are distressful sensations. We want to know what these sensations mean, and what is their relation to the central or common cause which upsets the balance of the different organs and symptoms. Again, we waste vast sums on drugs and yet we know little as to the real effects of many remedies. In making known and analysing the action and uses of many drugs which he employs, a vast field of useful work lies open to the general practitioner. But if we expect and desire the general practitioner to play this ideal and necessary role he must be helped and be provided with better facilities than he now commands. Fitful progress is being made in this direction, but it is the exception rather than the rule. Our present-day and future policy should be to remedy this and directed to making each local authority have so clear and serviceable an apprehension, both of the problem and its own share as to the means of its solution, that in each area there exist full local facilities for the general practitioner in respect of clinical and pathological laboratories, clinical centres for consultant advice, and co-operation with colleagues in his vicinity and easy access.

If this policy could be developed and made universal throughout the land, I foresee great advances and not a little by the agency of the general practitioner. I confess to great sympathies with these outposts of preventive medicine. Too long they have struggled against hopeless conditions, without laboratory facilities, without clinical centres or hospital accommodation and without or with only partial auxiliary aids such as nurses, midwives, dispensers and expert lay workers in electrical treatment and massage. No imposing hospitals will bring curative and preventive medicine into the homes of the people, that can be done only by the general

practitioner. He is the man to whom comes incipient disease, and if it is to be diagnosed before real damage is done, he must do it by the careful analysis of symptoms, by the use of laboratory methods and by the study of the whole art and science of prognosis and prevention. By providing him with means to help himself, I feel sure that in matters of health and all that pertains to the welfare of his district the general practitioner will indeed be the father of the people.

The recommendations made in respect of this matter by the Consultative Council of the Ministry of Health whereby secondary and primary health centres are proposed to be established are a great advance and a recognition of the views just expressed. In its broad outline, the scheme supplies that proper linking up between centre and periphery which so long has been wanting in the organization of the health services of the country, but, it must be remembered that the economic circumstances for the orderly working out of our sanitary salvation are far from promising. In this as in other matters, we need to be patient and also encouraged because the connexion between the general practitioner, the consultant, the specialist and their auxiliaries, as well as the ways in which domiciliary and institutional treatment affecting each class have been well thought out and a scheme presented full of promise for better things. Optimistic and hopeful as I am as regards this question, I am tempted to utter one word of warning. Let us not forget that, as the provision of medical service extends, the Ministry of Health will acquire an increasing control over medical policy and consequently over the medical profession. I shall watch developments, with keen interest, but I shall be sorry to see the centre of gravity of a learned profession drift into the hands of a Government Department. Professions, like nations, have need of self-determination, and the advocates of vocational representation will need to see that the principle is not lost to view.

The remedy appears to me to lie in the formation of local medical consultative councils with functions analogous in their relation to the local health authority with that of the consultative councils of the Ministry of Health, coupled with adequate direct representation of the profession on all administrative bodies connected with public health.

There are, however, some other aspects connected with the general practitioner in relation to preventive medcine which should be borne in mind. Undoubtedly, the general practitioner could do much good work in furthering the objects of disease prevention by a timely understanding of early symptoms and signs, but we must remember that the prime function of the general practitioner is to treat disease, and that the public ever regard him in that light; and it follows that his potentialities in respect of preventive medicine are likely to be indirect and secondary to curative medicine. In the sphere of preventive medicine, the employment of whole time officers of special training is inevitable and not replaceable by general practitioners, but I cannot but think that a closer co-operation between the work of those officers and that of the general practitioners

might be organized. The administration of the Public Health Acts has not only failed to attract the sympathetic co-operation of the general practitioner, but I fear it has sometimes tended to divorce his interest in the work. This is to be regretted as the opportunities to do good preventive work come daily to the general practitioner. Therefore, if the work and position of the general practitioner is to develop along proper lines, he must be given a definite place in the scheme of preventive medicine, more especially in such spheres as pre-natal work, infant welfare, national health insurance and the Poor Law service. This and cognate problems can only reach a satisfactory solution by a root and branch reform of our public health procedures and organization, and doubtless will receive full attention when public health administration is revised and remodelled. But even so, *quâ* preventive medicine, is all well with the general practitioner, either as a student or as a finished product of the schools? I am afraid not. If he is to take any important part in the prevention of disease in the future, he must be taught prevention systematically and thoroughly as a student. I recall my own student days and how small, if any, a part the prevention of disease occupied in my studies as compared with the diagnosis and treatment of disease already existing. It happened that I went into the army and there I was confronted at once with the preventive side of medicine and found that I had much to learn which should have been taught me before. I was forced to think as much of the unit aggregation of men as I was of the individual man. I believe things are somewhat better now in the medical schools, but, judging by what I have seen and heard among young graduates there remains yet more to be done. The aim of medical education should be not only to turn out expert clinicians, but also to produce a body of practitioners with enthusiasm for prevention and with sufficient knowledge and interest to make certain that some, if not all, will contribute to the future progress of preventive medicine. The immediate dramatic appeal may be wanting as compared with the successful treatment of some urgent case, but viewed in full perspective it is obvious that where the treatment of diseased persons deals with individuals, successful prevention affects thousands, and has a far-reaching effect upon human happiness and progress by eliminating that worst of handicaps, called ill-health. Do not think that I am advocating more lectures to youths, far from it. What I do advocate is some scheme whereby the student should be brought into contact with the realities of epidemiology and preventive medicine. This well might be done by developing in each centre of learning a preventive medicine investigation bureau with a suitable and competent investigator in charge. In such an epidemiological laboratory, systematically supplied with all the information which is received in the routine course by the public health departments, central and local, individual or groups of students could be made to follow the history of various outbreaks of disease, to note the waxing and waning statistics of morbidity, to realize the action taken by the sanitary authorities

and to receive expert opinion and explanation of why and wherefore. True, the sense of responsibility would not be there, but the student in such an atmosphere of facts and reasoned action, based on those facts, would appreciate and grasp the essence of scientific prevention of disease. Given such an insight into the meaning and working of the public health service, the young practitioner would start life knowing that in each town or village of the country there are some eight or ten governing bodies concerned with public health, supervised, aided or directed by a similar number of central departments of the State. He would be familiar with the principal means of administration as it affects domiciliary and institutional treatment and thus realize the essential unity of curative and preventive medicine, and that he is the first line of defence and attack in the warfare of disease prevention. I question whether this view is sufficiently grasped by the profession as a whole, and it is to urge its importance that I have dwelt upon the point.

Notwithstanding that I have occupied so much of your time in expressing views as to the outposts of the organization for disease prevention, I ask your indulgence for the expression of some thoughts concerning the actual staff officers of that service. I refer to the officers of the central departments and to that great and honoured body of men known as medical officers of health. Other than express the hope and conviction that it will press forward the initiation and direction of Research, I would say little as to what I think the Health Army Council or Ministry of Health should do, because I feel that if it can but do that which the Ministry of Health Act, 1919, empowers the Ministry to do, then it will, indeed, have justified its inception and the grateful thanks of the community. With the Central Research Committee as a controlling nucleus, the development of local centres of research throughout the land appears to be within the range of practical politics, and I have reason to think that such is the policy which occupies the thoughts and aims of the able and far-seeing men who at present control the new Ministry of Health. It is for us to be patient and hopeful of the best results.

Few appreciate more than I do the great work which has been done by medical officers of health all over the country; these are the men whom I picture as officers of the general staff of the great army mobilized against disease. Their work has long appeared to me to be badly organized and unequal. They are handicapped by having to work under and see the putting into effect of a number of Statutes bearing upon Public Health which are unduly complex and often overlapping. The prospect of an early consolidation, codification or revision of the public health laws seems remote, but in any such revision it is to be hoped that the responsibility for the prevention of disease will be made to rest with one authority. At present varying authorities are brought into operation by various Acts of Parliament, with the result that the Public Health is really in the hands of many departments of the central government and in the hands of many

officers and departments locally. How the machine works as well as it does has always been a mystery to me. Intimately associated with any revision of the Public Health laws is the question of the unit area of administration. Except in the large towns the unit area is too parochial, and my own view is that so far as the rural and suburban areas are concerned, these must be grouped into very much larger administrative units both for efficiency and economy. For my own part I conceive the division of the country into some dozen or fourteen large areas, each administered by a Commissioner of Health with plenary powers, responsible only to a Central Health Council in Whitehall, and with deputy commissioners as executives under him in the local areas. Possibly it is but the vision of an idealist, and one which I am not likely to see come into being.

In my ideal local authority I conceive the adoption of the following principles: the concentration in one authority in each local area of the responsibility for the full administration of health services from local rates, with or without Exchequer grants in aid, coupled with the use for the whole community of Poor Law medical institutions worked by a single Public Health Service, built up by an amalgamation of the existing services for Poor Law and National Health Insurance. In a word I favour the making of a new and independent local health authority to undertake new and consolidated functions in definite areas. As to what the areas should be, I foresee the subject of controversy, but if the three principles of (1) a consciousness of a community of interest and aim; (2) the need for uniformity of administration; and (3) a representation of the will of the people, as a whole, be steadily kept in view, there should ultimately be no difficulty in arriving at a sound solution of what is a difficult question. Whatever may be the final development, I hope that future health administration will not be hidden away in some corner of either an existing or future public body. It must be a clearly defined and independent branch of our social organization. In any event the profession of medicine must be prepared to take a much larger share in local administration than it has done in the past, but ever tempered by the view that, no matter how much the driving force behind it may be medical in origin and in reason, the local unit of health government can never be wholly medical in personnel or in purpose. It must be comprehensive, catholic, and disinterested.

Whatever the future may have in store for us either as to future legislation or areas, it is clear that public health administration is becoming so complex and technical or varied that only the very best men should be employed or be eligible for employment as medical health officers. This can be secured only by remodelling the training and examination of candidates. To my mind there are too many portals for obtaining the D.P.H., and the time is ripe for revising the training and qualification of men claiming to join the Public Health Service, particularly in the direction of a levelling up of preliminary scientific attainments and a

knowledge of the practical side of the work. Personally I would like to see the institution of a State examination, but this again may be but the dream of an idealist. Once appointed as a medical officer of health, the field of investigation lying before a man appears to be almost boundless. I mention but a few instances such as the analysis and differentiation of bills of mortality, deductive inquiries as to the causes and conditions of high ratios, dietary in relation to nutrition, dietary and energy among industrial workers, factors affecting susceptibility or resistance of the individual, the acute, the chronic and intermittent carrier, causes of recurring waves and cycles of infection, factors affecting susceptibility or otherwise of a community and the inter-relationship of disease. The mention of this last example tempts me to say how much we need constructive work to render precise the still vague notion of an epidemic constitution. For many years we were dominated by the dogma that specific diseases were real things to be found in the post-mortem room, and that epidemics were to be avoided by sanitation. Both beliefs were the outcome of Victorian realism, and even systematic bacteriology has failed to give us equilibrium since no bacteriological solution of epidemics has yet been achieved. We are still groping in the dark, and perhaps have dwelt too much upon materialistic instead of vitalistic interpretations of biological facts. We need accurate and comprehensive work as to the importance of *Bildung* as well as to that of *Gestalt*. I for one am unable to accept at face value the work of a man with his eyes glued to the ocular of his microscope as a valuable contribution to the epidemiology of influenza or any other disease. To me, a more truly valuable contribution to the epidemiology of an epidemic would be rendered by the man who could correlate and interpret the whole of the antecedent prevalent disorders and thus anticipate and diagnose the existence of an epidemic constitution before the death returns and notifications were sensibly affected. The various medical officers of health are the privileged first recipients of the early signs, and to their acumen and learning do we look for their correct and early reading. Therefore, in respect of these matters, a great field of difficult research lies open and before these public health general staff officers, but that the best use may be made of the opportunities only the best men should be appointed to that general staff. Moreover, I would add, since they constitute the specially trained and most experienced administrators in public health, I hope that they will be given every opportunity and encouragement to lend a hand in the great work of reconstruction which lies ahead of us.

I fear, Ladies and Gentlemen, that I have taken up too much of your time and been able to offer you little that is new, but the lesson is clear, that, as in the past, so in the future, prevention of disease cannot be imposed by edict, be it by a Ministry of Health or any other Ministry. The banishment of disease and invalidism in a community can only be secured on a basis of individual enlightenment in regard to the principles

and practice of personal and family hygiene, and it will be complete only when the knowledge of the proper use of fire, air, earth and water is appreciated by all. Sanitary authorities can make it easy for this knowledge to be disseminated in efficient and practical channels, also the civic life of the community and the public services run by such authorities may be object lessons for the individual citizen, but the ignorant, the prejudiced, and the selfish man will continue able to spoil the hygiene circumstances of his own life and those of his relations and neighbours; and this means that knowledge and education are the chief and only effective instruments among the public in the prevention of disease. Even all of us interested in preventive medicine and the would-be guiders of the general public, I conceive as really standing at the door of opportunity but fumbling at the lock trying to open it. The cause of our fumbling is that we have not the key or, at best, have but an imperfect key which fails to fit all the wards of the lock; the perfect key which still we lack is knowledge.

These, then, have been my thoughts, and they are: "Thoughts of things which Thoughts but tenderly touch." Actually, they are a confession of our ignorance and a plea for knowledge and the wisdom to make good use of that knowledge. It is sufficient to remind you as practical men and women that the word of action is stronger than the word of speech, but action without knowledge is action in vain; moreover, the knowledge which a man can use must be real knowledge, and the real knowledge which we need is the master-word of the New Humanity. "The rest hangs as dust about the brain or dries like raindrops off the stones." I conclude with Tennyson's words:—

Who loves not knowledge? Who shall rail
Against her beauty? May she mix
With men and prosper! Who shall fix
Her pillars? Let her work prevail."

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THE PATHOGENICITY OF THE MENINGOCOCCUS.

By Lieutenant-Colonel M. H. GORDON, C.M.G., C.B.E.
Late Royal Army Medical Corps.

(*Concluded from p.* 385.)

FURTHER OBSERVATIONS ON THE REDUCTASE AND ENDOTOXIN OF THE MENINGOCOCCUS.

A.—Comparison of the Reductase of the Meningococcus with that of Staphylococcus epidermidis and of Bacillus coli Respectively.

(*a*) *Effect of Exposure to a Temperature of* 70° *C.*

A slope culture on trypagar was made of *Staphylococcus epidermidis* and another of *Bacillus coli*, and after eighteen hours at 37° C., the growth on each was suspended in 2·5 cubic centimetres of broth and one cubic centimetre of the suspension then heated to 70° C. for one hour. On testing the reducing power of the suspensions before and after they had been heated, it was found that while before heating both bacteria up to at least $\frac{1}{150}$ of a slope reduced methylene blue, after the heating no reduction was produced even by $\frac{1}{8}$ of a slope. The reductase of both these bacteria, therefore, is no more resistant to a temperature of 70° C. than is that of the meningococcus.

(*b*) *Effect of Desiccation.*

The growths on three one-day slopes of the meningococcus (T. I. Smith) *S. epidermidis* and *B. coli* respectively were each suspended in 2·5 cubic centimetres of broth, and 0·5 cubic centimetre of this suspension was then placed in a watch glass and dried *in vacuo* at 37° C. overnight. Next morning the dry deposit in each watch glass was taken up in one cubic centimetre of distilled water, a culture made, and the reducing power tested in the usual way. The result was as follows :—

	Fractions of slope			
	Reducing power			Vitality
	1/10	1/20	1/40	1/10
Meningococcus ..	–	–	–	–
Stapylococcus ..	+	+	+	+
Bacillus coli ..	+	+	+	+

It appears that whereas after desiccation the meningococcus had lost both its vitality and reducing power, the two hardier bacteria had retained both qualities.

B.—Serviceability of the Reductase for Detecting the Presence of Living Meningococci in Body Exudates.

Experiment I.—In order to determine if the reductase test can be applied to detect the presence of living bacteria in an exudate an experiment was made in the first place to see if an exudate free of bacteria reduces methylene blue.

A guinea-pig weighing 350 grammes was injected intraperitoneally with ten cubic centimetres of ten per cent Witte peptone dissolved in saline, and killed by ether next morning. The peritoneal cavity was found to be filled with a large exudate rich in polymorphonuclear cells, but free of bacteria. By diluting 0·5 cubic centimetre of the exudate through successive 0·5 cubic centimetre amounts of broth a series of dilutions was obtained of 1 : 2, 1 : 4, 1 : 8, 1 : 10, etc., and methylene blue was added to each of these and the tubes kept for two hours at 37° C. Although the leucocytes formed a thick white precipitate in the first tubes no definite reduction of the methylene blue was observed except for a trace in case of 0·5 cubic centimetre of the undiluted exudate. On now adding a rich suspension of living meningococci to the exudate and repeating the test, reduction of the methylene blue was effected up to the seventh successive dilution (1 : 128). It appeared, therefore, that whereas the exudate *per se* failed to reduce when diluted in broth 1 : 2 and more, this exudate did not prevent the meningococci from exercising their reducing power.

Experiment II.—The growth on two one-day-old plates of a virulent Type II meningococcus (Lindenbaum) was suspended in ten cubic centimetres of equal parts broth and saline and injected intraperitoneally into a guinea-pig of 390 grammes weight. The dose thus given represented an eight-fold fatal dose. After five hours the guinea-pig was killed by ether and its peritoneal fluid and blood collected and examined for reduction of methylene blue in the usual way. Cultures were also made from measured amounts of the peritoneal exudate and the blood of the guinea-pig. The results were as follows:—

Number of living meningococci. The blood of the guinea-pig contained over one hundred but less than one thousand living meningococci per cubic centimetre, and the peritoneal exudate over one thousand but less than ten thousand living cocci per cubic centimetre, as judged by cultures made from quantitative dilutions of these materials.

The reducing power of the suspension of cocci injected, of the peritoneal exudate before and after being centrifuged, and of the blood before and after clotting is shown in the table on next page.

It would appear that

(1) The suspension was eight times as active as the exudate; but its dilution by the exudate must be taken into account, also the elapse of five hours since the injection.

(2) The exudate after being centrifuged had lost seven-eighths of its reducing power by removal of a large portion of its particulate matter.

No.	Material	Dilution in broth									
		1/2	1/4	1/8	1/16	1/32	1/64	1/128	1/256	1/512	1/1024
1	Suspension injected	+	+	+	+	+	+	+	+	+	–
2	Peritoneal exudation	+	+	+	+	+	+	–	–	–	–
3	Peritoneal exudation after centrifugation	+	+	(+)	–	–	–	–	–	–	–
4	Blood before clotting	+	–	–	–	–	–	–	–	–	–
5	Serum	+	+	–	–	–	–	–	–	–	–

+ = reduction of methylene blue.

(3) The blood of the same guinea-pig had some slight reducing action on methylene blue better seen when the red corpuscles were removed—possibly because they to some extent neutralized the reducing agent.

Conclusion.—The reductase of the meningococcus can be applied to detect the presence of this micro-organism when present in a body exudate in living condition and in large numbers.

C.—The Endotoxin of the Meningococcus.

The experimental study of the pathogenic action of the meningococcus described in a preceding section led to the conclusion that two different factors are here involved, namely, (1) a labile element, especially prominent in the most virulent specimens of the meningococcus, and intimately bound up with an ability on the part of the coccus to multiply in the tissues of its host; and (2) a more stable toxic element, intracellular in origin, and still in evidence when the vitality of the coccus has been destroyed. The object of the present section is to describe the result of further study of this endotoxin of the meningococcus.

This investigation was determined by demands of a very practical nature. During earlier stages of the outbreak an undesirable fluctuation in the therapeutic potency of the antimeningococcus serum then available was the cause of much concern. This concern was increased when it was found, on comparing in the laboratory the serum that had proved most potent clinically with numerous samples of antimeningococcus serum of inferior therapeutic value, that none of the three indices of potency chiefly advocated up to that time served to distinguish between them. Thus the superiority of the successful serum lay neither in its opsonin content, nor in its agglutinin content, nor in its yield of complement-fixing antibodies. When, therefore, towards the end of 1917 it was found that of all the specimens of antimeningococcus serum under investigation, the clinically potent serum alone possessed the ability to neutralize the toxic action of the dried meningococcus in the peritoneal cavity of the mouse; and also, that this toxin-neutralizing capacity of the serum extended to both of the commonest types of the meningococcus, it seemed that the long-sought-for clue to potency had been obtained, and further

study of the endotoxin of the meningococcus was indicated. This investigation, however, was prevented for a considerable time by the more pressing need first of testing numerous samples of antimeningococcus serum so as to select the best for immediate clinical use, and secondly by the necessity of obtaining some information as to the conditions under which meningococcus antiendotoxin is to be found in the circulating blood of an animal in course of immunization. Accordingly it was not until the middle of 1918 that an investigation could be begun for the purpose of obtaining further information concerning the endotoxin of the meningococcus.

In the meantime, the method used for determining the antiendotoxic capacity of various samples of serum—though the best that could be elaborated at the time—was far from perfect. The serum that had proved most efficient clinically was found to neutralize one M.L.D. of the dried coccus of each of the two commonest types of the meningococcus with 0·5 cubic centimetre of the serum. In testing samples of serum to see if they came up to this standard, it was found that if a dose of powdered dry coccus was administered that exceeded the M.L.D. for the mouse, very few samples indeed of antimeningococcus serum then available were capable of neutralizing it; and if a subminimal lethal dose was used, the controls lost in conclusiveness. It was clear that this dilemma would only be disposed of satisfactorily when in addition to improved knowledge of the conditions under which antiendotoxin is generated—information indispensable for the preparation of more potent serum in quantities sufficient to meet demands—a method could be arrived at of obtaining the endotoxin in a form that would permit of more accurate measurement of its toxic effect. It seemed possible also that a satisfactory solution of the latter problem might even go some way towards resolving the former as well.

For these reasons, the present study of the endotoxin of the meningococcus has been influenced largely by a desire to obtain if possible a method of getting the endotoxin of this micro-organism into solution. In the first place, however, an investigation was made in order to ascertain whether the endotoxin contained by the meningococcus can be increased by raising the virulence of the coccus by animal passage.

(*a*) *Experiments to determine* (1) *if the Virulence of the Meningococcus can be increased by Animal Passage; and* (2) *if in the event of such Increase of Virulence, the Endotoxin contained by the Coccus is also increased.*

Four specimens of the meningococcus—two of Type I and two of Type II—were each injected into mice, and on recovery from the heart's blood of the first mouse passed through a succession of further mice in the same way. After several passages the virulence of each coccus for the mouse was again measured. In only one of these cocci could any increase

be detected, namely, in the case of Type I, strain Howes, that before mouse passage killed when alive in a dose of 5,000 millions, not in a dose of 2,500 millions; but on recovery from the fourth mouse in succession killed in a dose of 500 millions. The virulence of this particular coccus, therefore, had increased tenfold.

In order to determine if this increase of virulence was accompanied by an increase in the endotoxin content of the coccus two procedures were tried. In the first place a portion of the identical suspension of the Howes coccus (that on recovery from the fourth mouse proved fatal in a dose of 500 millions when living) had been dried, and the toxicity of this was compared with that of the same coccus before mouse passage when dried in the same way. No difference, however, could be detected in the toxicity of these two specimens of dried coccus. Secondly, the growth on trypagar plates of the coccus before and after mouse passage was collected, washed in saline, dried, and the toxicity of the watery extracts of the dried cocci, and also the dried cocci themselves, compared. Again the toxicity was equal. This experience indicates therefore: (1) that since three of the four cocci failed to show increase of virulence, it is exceptional to get an increase in the virulence of the meningococcus by passing it through mice; (2) that when such increase of virulence does take place, it is not necessarily accompanied by an increase in the portion of the endotoxin of the coccus that survives drying.

(*b*) *Comparison of the Value of Various Solvents for Extracting the Toxin from the Dried Meningococcus.*

A comparison was made of the value of distilled water, saline, absolute alcohol, acetone, and ether for this purpose by grinding up 0·1 gramme of the dried coccus (Type I, strain Howes) in an agate mortar and slowly adding five cubic centimetres of the solvent. The mixture of each solvent with the dried coccus was then transferred to a centrifuge tube, stood over night in the ice chest and centrifuged. The results were as follows:—

(i) Naked-eye appearance of the extracts.

(*a*) Water extract. The fluid is more opaque and the deposit is less abundant than in any of the others.

(*b*) Saline extract. The fluid is slightly opalescent and the deposit is over twice as large as in the case of water.

(*c*) All of the remaining extracts are clear and the cocci completely deposited. The acetone extract was slightly yellow, apparently from some substance extracted from the cocci which deposited in yellow drops when the acetone was evaporated off.

(ii) Microscopic appearance of the deposits.

Films were made of each deposit, fixed, stained, and examined. The results were as follows —

Solvent	Deposit
Water	Sludge. No formed cocci seen.
Saline	Sludge.
Acetone	Mostly sludge. A few cocci.
Alcohol	Many cocci seen.
Ether	Cocci not disintegrated at all.

(iii) Amount of the dried coccus taken up by each solvent.

The deposits were collected from the centrifuge tubes, dried, and re-weighed. The results were as follows:—

	Milligrammes of dried coccus				
Solvent:	Water	Saline	Acetone	Alcohol	Ether
Before extraction ..	100	100	100	100	100
After ,, ..	14	34	57	55	55

A good deal of the dried coccus was unavoidably lost in pouring the materials from the agate mortar into the centrifuge tubes, and in transferring the deposits in the latter to watch glasses for drying. In spite of this the main result is clear, the water having obviously taken up more than the other solvents.

(iv) Toxicity of the residues.

No material difference could be found in the toxicity of the dried cocci recovered after extraction by the various solvents.

(v) Toxicity of the extracts.

Both the water and saline extracts proved toxic to mice intraperitoneally, the former being the more active. The toxicity of the other extracts was not tested on this occasion; but a test of similar extracts was made later by evaporating off the solvent, dissolving up the dry deposits in water, and injecting them intraperitoneally into mice. These mice remained unaffected.

Conclusion.—Distilled water takes up more of the dried coccus and of its endotoxin than any of the other solvents. In consequence distilled water was adopted in the first place for the routine purpose of extracting the toxin from the dried meningococcus when testing samples of serum for antiendotoxin.

(c) *The Value of Improved Mechanical Disintegration for Extracting Endotoxin from the Dried Meningococcus.*

Comparison was now made of the toxicity of extracts prepared with distilled water, and (*a*) grinding up the coccus in the usual way; (*b*) adding an equal amount of well-washed and sterilized sand before grinding. Both extracts were lightly centrifuged to throw down the larger particles and the sand before testing them for toxicity. As it was found that the addition of sand increased the amount of toxin in the extract, this procedure was adopted for routine purposes.

At this stage, therefore, the method used for testing sera was to weigh out 0·1 gramme of the dried coccus, to add an equal amount of sand, and after thoroughly grinding up the mixture to add slowly five cubic centi-

metres of distilled water while continuing the grinding. The mixture was then centrifuged lightly in order to throw down the sand. The supernatant fluid which was opalescent in colour was fatal to the mouse intraperitoneally in a dose of 0·1 to 0·2 cubic centimetre. For preserving it, a few drops of ether were added.

(*d*) *The Value of Sodium Hydroxide for getting the Endotoxin of the Meningococcus into Solution.*

Numerous experiments were now made in order to determine whether the well-known solvent properties of sodium hydroxide could be made use of to obtain the endotoxin of the meningococcus in solution. In this relation importance attaches to the following points:—

(1) The toxicity of NaOH *per se* when administered intraperitoneally to the mouse.

(2) The degree to which it dissolves the meningococcus, and

(3) The extent to which it alters the endotoxin.

(1) Toxicity of NaOH for the mouse.

The M.L.D. of NaOH intraperitoneally for a mouse of 15-20 grammes was found to be 0·5 cubic centimetre of a N/10 solution, or 2 milligrammes of NaOH.

(2) The value of NaOH for dissolving the meningococcus and obtaining its endotoxin in solution.

Experiments with the Dried Coccus.—N/1 NaOH was tried in the first place. In a preliminary experiment it was found that by grinding up 0·1 gramme of the dried coccus in 1·25 cubic centimetre, N/1 NaOH, by now adding 1·25 cubic centimetre of water, and then placing the fluid in a water bath at 37° C. for one hour, and finally reducing the alkalinity to N/50, a solution of the bacterial protein and endotoxin was obtained with the endotoxin unaltered, as proved by the ability of antiendotoxic serum, but not of other serum to neutralize it. Nevertheless, in further experiments this method proved too uncertain for routine use owing to the tendency of the strong NaOH to destroy the toxin.

An attempt was next made to get the dry coccus into solution by grinding the powder up directly in falling amounts of NaOH, e.g., N/2, N/4, N/10, N/20, etc., subsequently reducing the alkalinity to N/50 where necessary by dilution or neutralization, or by both. As only imperfect solution of the dry coccus took place, however, the method was abandoned.

The effect was now tried of adding falling amounts of NaOH to a suspension of the dried coccus already made by grinding it up in water. As before, the stronger solutions of NaOH were found to destroy the endotoxin, but the weaker solutions (N/20, N/40, etc.), were found to liberate toxin from the particles of dried cocci without destroying it, and to considerably improve the sureness of the killing power of the suspension.

For this reason, and also because it saves so much time and labour, the addition of dilute NaOH to the suspension of the dry coccus was henceforth adopted for routine use.

In order to avoid loss of toxicity on keeping, a smaller amonnt of the dried coccus is used, and the samples of serum tested shortly after preparing the endotoxin. Procedure is as follows: 0·05 gramme of the dried coccus is ground up in an agate mortar with 1·25 cubic centimetre of distilled water, and after grinding for a few minutes 1·25 cubic centimetre of N/20 NaOH is added. The suspension undergoes rapid clearing when the NaOH is added. This fluid is then transferred to watch glasses already set out for each serum. The dose of dissolved endotoxin used is generally 0·1 cubic centimetre or 0·15 cubic centimetre, according to the toxicity of the dried coccus in use; 0·5 cubic centrimetre of serum is then added to each watch glass, normal serum being added to the first pair, and each of the samples of serum for test to the others. The mixtures of serum and toxin are placed in the incubator for thirty minutes, and then the contents of each watch glass are injected intraperitoneally into a mouse. The experiment is carried out in duplicate, so as to reduce error due to the varying susceptibility of individual mice. The mice are kept under observation for two to three days and the result recorded. Since this method was elaborated, it has been in routine use for the purpose of testing samples of serum for antiendotoxin.

Experiments with the Raw Coccus.—Kraus and Doerr observed that the addition of N/10 NaOH to the raw coccus renders the killing power of its endotoxin more sure. This solution, however, is unnecessarily strong, and is certainly too strong when mice are used, since 0·5 cubic centimetre of the N/10 solution *per se* is fatal to them.

Some experiments made with a suspension containing approximately 200,000 raw meningococci per cubic centimetre, showed that when present in a concentration of N/40, the NaOH produced partial solution of the cocci and increased the sureness of the killing power of the suspension. This toxicity also was retained by the fluid of the suspension when the cocci were centrifuged out of it. It would appear, therefore, that in case of need endotoxin can be obtained from the raw coccus by this procedure for the purpose of testing the antiendotoxic value of samples of serum. It was observed that the addition of dilute alkali, e.g., N/80 or N/160, to suspensions of the raw meningococcus rendered them very viscid, a change due probably to the liberation of mucin from the coccus.

(c) *The Value of Autolysis for the purpose of obtaining a Solution of Meningococcus Endotoxin.*

Some experiments were made in which suspensions of the raw coccus in water or saline were incubated with toluol or ether as preservative in order to ascertain the comparative value of autolysis for the purpose of obtaining a solution of the endotoxin. Although active endotoxin was

found free in the fluid in some cases after twenty-four hours at either 37° C. or laboratory temperature, it was apt to disappear later; and as on repeating the experiments this method was found to be less sure as a source of active endotoxin than the dried coccus, it was not adopted.

(f) The Effect of Heat on the Endotoxin of the Meningococcus.

Experiment 1.—The effect of heat was tried in the first place on the toxicity of a suspension of Type I meningococcus, strain Smith, prepared by suspending the growth of each of two trypagar plates of eighteen hours' incubation at 37° C. in five cubic centimetres of distilled water, and then pooling them. After microscopical examination the suspension was divided into four parts, one of which served as control, while the other three were heated for half an hour to 55° C., 100° C., and 120° C. respectively. The two later temperatures were obtained by heating the tubes containing the suspension in a water bath of boiling water, and in the autoclave respectively. At the same time also the effect of heat was determined in the same way on the Smith coccus after it had been dried, the suspension used for this purpose being made up by grinding up two lots of 0·1 gramme of the dried coccus in 5 cubic centimetres of distilled water, and then pooling them. Both watery suspensions of the Smith coccus, raw and dried respectively, failed to kill a mouse in a dose below 0·1 cubic centimetre. The effect of heat on their toxicity was found to be as follows:—

Treatment	Dose	Raw coccus	Dried coccus
Unheated	0·1	+	R
	0·2	+	+
	0·3	+	+
Heated to 55° C. for 30 minutes	0·1	+	+
	0·2	+	+
	0·3	+	+
Heated to 100° C. for 30 minutes	0·1	+	R
	0·2	+	+
	0·3	+	+
Heated to 120° C. for 30 minutes	0·1	+	+
	0·2	R	+
	0·3	+	+

+ = mouse died. R = mouse ill; recovered.

The mice that succumbed to the raw unheated coccus grew meningococci from their hearts' blood; the blood of the other mice that died was sterile.

The Smith coccus, therefore, whether raw or dried, withstood heating to temperatures up to 120° C. for thirty minutes without loss of toxicity.

Experiment 2.—The experiment was next repeated on Type II, strain Pugh, in the same way. The results were as follows:

Treatment	Dose	Raw coccus	Dried coccus
Unheated	0·1	+	+
	0·2	+	+
	0·3	+	+
Heated to 55° C. for 30 minutes	0·1	+	+
	0·2	+	+
	0·3	+	R
Heated to 100° C. for 30 minutes	0·1	R	+
	0·2	+	+
	0·3	+	+
Heated to 120° C. for 30 minutes	0·1	+	O
	0·2	+	O
	0·3	+	O

+ = mouse died. R = mouse ill; recovered. O = mouse unaffected.

Whereas the Pugh coccus, when raw, withstood heating to 120° C. without loss of toxicity, the suspension of the same coccus when dried lost its toxicity within half an hour at this temperature.

Experiment 3.—The experiment was repeated on two further specimens of Types I and II respectively, strains Howes and Morgan. Suspensions of the raw coccus were used, exposure to 55° C. was omitted, and the effect of exposure to 120° C. for two hours was tried instead. The results were as follows:

Treatment	Dose	Howes	Morgan
Unheated	0·1	R	+
	0·2	R	R
	0·3	+	+
Heated to 100° C. for 30 minutes	0·1	R	+
	0·2	+	R
	0·3	+	R
Heated to 120° C. for 30 minutes	0·1	R	O
	0·2	R	O
	0·3	+	O
Heated to 120° C. for 2 hours	0·1	R	O
	0·2	O	O
	0·3	O	O

+ = mouse died. R = mouse ill; recovered. O = mouse unaffected.

It would appear that the Howes coccus retained some of its toxicity after exposure to 120° C. for thirty minutes, but lost it after two hours at this temperature. The toxicity of the Morgan coccus was destroyed within half an hour at 120° C.

Experiment 4.—The effect was now determined of heating the raw suspensions used in experiments 1 and 2 to 120° C. for two hours. Sufficient of the suspension of each that had been heated to 55° C. for

thirty minutes remained for this purpose. It was found that whereas both these suspensions were toxic to mice before being autoclaved, neither of them showed any evidence of toxicity after being exposed for two hours to 120° C.

Conclusion.—These experiments on mice led to the following conclusions. The endotoxin of the meningococcus withstands heating to 100° C. for thirty minutes, and in some cases to 120° C. for this time. At 120° C., however, it is destroyed within two hours. As might, perhaps, have been expected, the loss of toxicity produced by heat is more evident in cocci of low than in those of high toxicity.

Confirmatory Experiment on Guinea-pigs.—At a later date, when investigating the question of the secretion of soluble toxin by the meningococcus in the peritoneal cavity of the guinea-pig the opportunity was taken of repeating the above experiment on guinea-pigs. Four large guinea-pigs were selected of between 350 and 450 grammes weight. A recently isolated meningococcus (Type II Lindenbaum) of good virulence was used and eight plates of it of eighteen hours' growth suspended in altogether sixteen cubic centimetres of equal parts of saline and broth. This suspension was divided into four equal portions, the first of which was used as control, the remainder heated for half an hour to 55° C., 100° C., and 120° C. respectively. Each portion was then injected into the peritoneal cavity of a different guinea-pig. Further details of this experiment and the results are seen in the following table:

No.	Treatment of coccus	Vitality	Weight of guinea-pig	Result	Peritoneal fluid		
					Lesion	Film	Culture
1	Raw	+	380	Dead in 18 hours	Hæmorrhagic peritonitis	Swarming with cocci	+
2	Heated for 30 minutes to 55° C.	—	450	,, ,,	Hæmorrhagic peritonitis	Swarming with cocci	—
3	Heated for 30 minutes to 100° C.	—	390	,, ,,	Serous peritonitis	Swarming with cocci	—
4	Heated for 30 minutes to 120° C.	—	350	,, ,,	Serous peritonitis	Swarming with (Shadows)	—

The dose given to each of these guinea-pigs was about eight times the M.L.D. of the living coccus for a guinea-pig of this size; the dose therefore was a large one. The result, however, goes to confirm the previous observation on mice to the effect that the endotoxin of the meningococcus may withstand heating for thirty minutes to 120° C. It is noteworthy that although the meningococcus in this experiment produced hæmorrhagic peritonitis raw, and when heated to 55° C., it failed to do so after being heated to 100° C.

(g) *Trial of Vaughan's Method for the purpose of obtaining a Solution of the Endotoxin of the Meningococcus.*

The principle of this method which has been applied by V. C. Vaughan and S. M. Wheeler to *B. coli* and other bacteria is to boil up the dried bodies of the micro-organism with absolute alcohol containing two per cent of NaOH. By repeated boilings of an hour's duration under a reflux condenser the bacterial protein is split up and the intracellular poison is taken up by the alkaline alcohol, from which it can be recovered by neutralizing the alkali with HCl, and after removing the salt thus formed, evaporating off the alcohol. The deposit left is soluble in water and very toxic.

As this method does not appear to have been applied previously to the meningococcus, an attempt was made to extract the endotoxin from that micro-organism by means of it. The method as described by Wheeler (*Journal of American Medical Association*, April 22, 1908) was followed. A gramme of the dried meningococcus (Type I, strain Smith) was powdered well, extracted with ether in a soxhlet, and again dried. The weight of dried coccus recovered from the soxhlet was 0·8 gramme. This powder was next boiled three times over for one hour in absolute alcohol containing 1 : 50 of NaOH. The alcohol was then neutralized with HCl, filtered, and evaporated to dryness. The yellow scaly deposit thus obtained was dissolved up in water and injected intraperitoneally into mice, but no toxic effect was observed. The residue of the bacterial bodies was now tested in the same way, but again with no result. The prolonged boiling in alkaline alcohol apparently had destroyed the endotoxin of the meningococcus. The antigenic value of the extracted bodies was examined by Major A. S. G. Bell, who found its specific agglutinogenic properties to be intact.

The method was tried once more, but again without success. In this case, however, while the deposit from the alcoholic extract was without toxic action, a little endotoxin was still left in the coccus bodies.

(h) *A Method of obtaining the Endotoxin in Solution.*

Although Vaughan's particular method of combining heat with alkali was not successful, nevertheless, in view of the ascertained resistance of the endotoxin of the meningococcus to heat and to dilute alkali separately, it still seemed possible to obtain a solution of it by this means. Accordingly, before the Central Cerebrospinal Fever Laboratory was demobilized the following experiments were carried out.

Experiment 1.—The effect was first tried of boiling the dried coccus in N/40 NaOH (i.e., NaOH 1 : 1,000) dissolved in water. One gramme of the dried meningococcus (Type I, Smith) was put into a flask with fifty cubic centimetres of N/40 NaOH and boiled for one hour in the steamer. The reaction which was now N/110 NaOH was increased to N/40 and the boiling repeated for one hour. After the second boiling the alkalinity, which was

again N/110, was increased to N/40 and the boiling repeated for one hour. The mixture was now neutralized with HCl. The coccus bodies had largely gone into solution, a clear brown-coloured fluid resulting. This fluid mixed well with water, entering apparently into complete solution with it. On testing the toxicity, however, it was found that 0·5 cubic centimetre of the fluid was required in order to kill a mouse by the intraperitoneal route. As the M.L.D. of the suspension before being heated had been found to be 0·1 cubic centimetre, it was evident that the prolonged boiling even in N/40 NaOH had destroyed a large proportion of the endotoxin.

Experiment 2.—The experiment was now repeated, but the dried coccus was only boiled for half an hour in the N/40 NaOH, and then neutralized. Although solution was less perfect than in Experiment 1, and the resulting fluid far more opaque, the bacterial protein, nevertheless, was found to keep up well in it on standing. As the M.L.D. for the mouse intraperitoneally was found to lie between 0·1 and 0·2 cubic centimetre, but little of the endotoxin had been lost; and the toxicity was found to be practically the same after the solution had stood for two weeks at laboratory temperature. Since serum containing antiendotoxin for Type I, and neutralizing a suspension of this same Smith coccus in cold water, was also found to neutralize the toxic action of the present solution, the specificity of the endotoxin was unimpaired. While it is not claimed, therefore, that an entirely satisfactory method of obtaining meningococcus endotoxin in solution has yet been obtained, the present procedure would appear to constitute a material advance in that direction.

Summary.—Increase in the virulence of the meningococcus resulting from animal passage is not necessarily accompanied by a rise in its endotoxin content. As a means of obtaining meningococcus endotoxin, autolysis is not sure enough to be satisfactory. For extracting endotoxin from the meningococcus, distilled water proved superior to the other solvents tested. The addition of dilute NaOH increases the solvent power of water, and does not destroy the endotoxin. Meningococcus endotoxin withstands heating for half an hour to 100° C., and sometimes for half an hour to 120° C., but is destroyed within two hours at 120° C. By heating the coccus for not too long a time to 100° C. in dilute alkali its endotoxin becomes distributed through the fluid and this method, or some development of it, promises to be of considerable value in further studies of meningococcus endotoxin.

ANTIBODIES TO THE MENINGOCOCCUS.

The specific antibodies present in antimeningococcus serum include agglutinin, precipitin, complement-fixing substances, opsonin, lysin, and antiendotoxin.

It has already been related how agglutinin was found to have a direct practical application for the purpose of defining and identifying the meningococcus of one or another type; thus proving of the greatest use

not only in increasing the accuracy of the procedure provisionally adopted for limiting the spread of cerebrospinal fever, but also in enabling a watch to be kept on the general prevalence of the meningococcus in a community when cerebrospinal fever is present, and when it is absent; and during the rise and fall of an outbreak.

The practical application of bacteriology for the purpose of dealing with cerebrospinal fever, however, is not limited to prevention. Before the recent outbreak began the intrathecal administration of potent antimeningococcus serum had been conclusively shown by Flexner and others to be capable of materially reducing the mortality from this disease. But as yet no sure method of standardizing the serum had been arrived at; and largely as a result of this defect most of the antimeningococcus serum used clinically during earlier stages of the recent outbreak proved ineffective.

A study, therefore, was undertaken of the antibodies present in antimeningococcus serum, and when a consignment of this serum came to hand that was found clinically to possess a high degree of therapeutic efficacy, the antibody content of this batch of serum was compared at length with that of specimens of less successful serum with a view to defining the cause of its therapeutic superiority. For a considerable time this attempt to discover the antibody chiefly concerned in the therapeutic potency of antimeningococcus serum was in vain. How the desired information eventually came to light, the practical application made of this knowledge, and with what degree of success, will be seen later. The result of the studies that have been made of individual antibodies to the meningococcus will now be described.

AGGLUTININ.

A.—Antigens.

The chief preparation employed was a saline suspension of the meningococcus prepared in the following manner. The growth from trypagar plates of eighteen hours' incubation at 37° C. is suspended in saline and heated to 65° C. for thirty minutes in order to inactivate the autolytic enzyme of the coccus. The density of the suspension is then determined by transferring 0·1 cubic centimetre of it to a clean test tube and adding water (from a five cubic centimetre pipette graduated in tenths of a cubic centimetre) until the suspension is only just perceptibly turbid when compared with a control of water alone. This end-point may be taken to represent a density of 100 million cocci per cubic centimetre, and the amount of water needed to dilute the suspension to this point is readily determined in a few minutes. The calculation is a perfectly simple one, e.g., 0·1 cubic centimetre of the suspension requires ten cubic centimetres of water to reach the end-point; it contains therefore $10 \times 100 = 1{,}000$ million cocci, and a cubic centimetre of the suspension therefore contains 10,000 million cocci per cubic centimetre. After a little practice the end-

point is easily recognized and the calculation is simplified by realizing that every cubic centimetre of water required by 0·1 cubic centimetre of the suspension in order to reach the end-point indicates the presence of 1,000 million cocci per cubic centimetre of it. The density of the suspension having been determined, it is diluted with saline until it contains 2,000 million cocci per cubic centimetre, 0·5 per cent of phenol is then added and the suspension transferred to a glass-stoppered bottle. Suspensions made in this way keep for several months and can be used either as antigens, or for testing the agglutinating power of sera.

Other antigens tested at one time or another have been the sensitized raw coccus, the dried coccus, the raw coccus after being autoclaved for half-an-hour at 120° C., and the dried coccus after most of the endotoxin contained by it had been destroyed by boiling it up for three hours in absolute alcohol containing 1/50 of NaOH.

B.—*Mode of Dosage.*

Rabbits weighing from 1,000 to 1,500 grammes were used, as older rabbits react less specifically. The injections are made intravenously and the rabbits weighed daily. A suitable first dose is 500 million of the raw coccus. Hine's method consists in giving on the first day two doses of 250 million at an hour's interval, and on the fifth day a dose of 1,000 million. By this procedure the animal's serum may give a clear-cut titre of 1/400 to 1/800 by the tenth day. Another method is to give the rabbit a dose every forty-eight hours, beginning with 500 million and repeating the preceding dose before raising it.

C.—*Mode of conducting the Agglutination Test.*

Small glass tubes ½ inch broad by three inches long, plugged with wool, are used; they are held in square wooden racks designed by Major Hine which fit into the 55° C. incubator. Each rack holds nine rows of twelve tubes, and a strip of celluloid is nailed between each row and at either end. The principle always followed has been first to dilute the serum in saline, each dilution bulking to 0·5 cubic centimetre. When the dilutions have been made, 0·5 cubic centimetre of the saline suspension is run into each tube. An example is as follows:—

It is proposed to test a serum at 1/50, 100, 200, and 400. Four tubes are put into the rack, the first is left empty, and 0·5 cubic centimetre of saline is run into each of the three others; 0·1 cubic centimetre of the serum is now diluted with 2·4 cubic centimetres of saline, and 0·5 cubic centimetre transferred to each of the first two tubes; after shaking, 0·5 cubic centimetre from the second tube is transferred to the third, and from that 0·5 cubic centimetre to the fourth—0·5 cubic centimetre from the latter being then thrown away. A dilution is thus obtained of 1/25, 50, 100, and 200 of the serum; 0·5 cubic centimetre of the suspension is then added all round, the rack placed at 55° C., and the results read off after

twenty-four hours. A control with normal serum in the same way should always be carried out.

D.—*Absorption Tests.*

The object of these is to determine whether a given coccus removes the specific agglutinin from a specimen of agglutinating serum in the same manner as the homologous coccus, or not. The titre of the serum for the homologous coccus must be known. A low dilution of the serum is then made and divided into three parts, one of which is saturated by adding to it an equal quantity of the suspension of the homologous coccus, another is saturated in the same way with the test coccus, the third receives an equal amount of saline only. After standing in the incubator at 37° C. over night, the tubes are centrifuged, and the agglutinating titre of the unsaturated serum and of the two saturated sera respectively determined for each of the two cocci. The homologous coccus is found to have removed its own agglutinin. If the test coccus is of the same type, it removes this agglutinin also, but if of another type, the agglutinin is untouched. It is advisable to use freshly made suspensions for absorption tests, and Major Tulloch prefers to use a suspension of 4,000 million cocci per cubic centimetre for saturating the serum rather than a suspension of 2,000 million per cubic centimetre.

E.—*Agglutinogenic Values of various Preparations of the same Meningococcus.*

It has already been stated that the antigen with which the agglutinating serum was prepared (that was used for identifying the meningococcus during the outbreak) was a saline suspension of the raw coccus heated at 65° C. and then phenolated.

Recently, when comparing the value of various preparations of the same coccus for exciting the production of antiendotoxin, the opportunity was taken of observing also their agglutinogenic capacity. The coccus used was Type I, strain Howes; and the antigens compared were (1) a suspension of the raw coccus; (2) the same suspension after being sensitized by homologous serum subsequently removed; and (3) a standard suspension of 0·1 gramme of the dried coccus in five cubic centimetres of distilled water.

The experiment was performed in duplicate, three rabbits receiving a stationary dose throughout, while in three other rabbits the dose was slowly raised. Further particulars are as follows :—

Five doses in all were given of each antigen, the interval between the first two being seventy-two hours, and between the remaining doses forty-eight hours. The first dose in case of the raw and sensitized coccus respectively was 500 million, and in the two rabbits in which the dose was raised the last dose was 700 million. In case of the dried cocc

the first dose was 0·05 cubic centimetre of the standard suspension representing one milligramme of the dried coccus, and in case of the rabbit in which the dose was raised the last dose was 0·07 cubic centimetre of the suspension or 1·2 milligramme of the dried coccus. On the eleventh day of the experiment, and twenty-four hours after the fifth dose, all six rabbits were bled and their serum tested against the homologous Type I coccus and also against a representative coccus of each of the other three types. All of the six sera proved negative in a dilution of 1/50 against these cocci of heterologous types. The results against the homologous coccus were as follows:—

Antigen	Dosage	Dilution of Serum						
		1/100	1/200	1/400	1/800	1/1,000	1/2,000	1/4,000
Raw coccus	Stationary ..	+	+	+	+	+	..	..
	Raised	+	+	+	+	+	+	..
Sensitized coccus	Stationary ..	+	..	..	..	..	..	..
	Raised	+	+	+	(+)	..	..	..
Dried coccus	Stationary ..	+	+	+	+	+	+	..
	Raised	+	+	+	+	+	+	..

+ = well-marked agglutination.

Inferences drawn from these results were as follows:—

(1) Since none of the six sera contained agglutinin for heterologous types, all of the antigens were specific.

(2) As regards the best antigen, clearly the raw coccus was superior to the sensitized coccus for exciting the production of agglutinin, though this superiority was reduced when the dose of the sensitized coccus was raised. The two rabbits receiving the dried coccus both gave a full response; but in their case the dose given was relatively much larger.

(3) As regards the effect of raising the dose, it is noteworthy that in case of both raw and sensitized coccus, the rabbit gave a better production of agglutinin with the raised dose. In case of the dried coccus, on the other hand, the stationary dose consisting of one milligramme of the dried coccus was sufficient to evoke a maximum response.

F.—*The Effect of Autoclaving the Meningococcus on its Antigenic Specificity.*

Shortly before the Central Cerebrospinal Fever Laboratory was closed Major Tulloch very kindly carried out the following experiment. Saline suspensions of representatives of each of the four types of the meningococcus respectively were autoclaved at 120° C. for half an hour, and a rabbit was then prepared against each. In all cases agglutinin was formed; but while this agglutinin was active against the ordinary suspension of the raw coccus of the homologous type (heated to 65° C. for thirty minutes and then phenolated) and was strictly specific, it failed

to affect the autoclaved suspension which had stimulated its production. The specific agglutinogenic substance of the meningococcus therefore would appear to withstand not only desiccation, but also exposure in the autoclave for half an hour at 120° C. The fact that the specific agglutinogen of the raw coccus withstands heating for thirty minutes to 120° C. was confirmed later by Major Bell who found, however, that this exposure had the effect of reducing it, and that exposure at 120° C. for two hours abolished it altogether. It may be recalled that in an observation previously recorded when applying Vaughan's method of extracting endotoxin to the meningococcus, it was found that the dried bodies of meningococci after being boiled three times over for an hour each time in absolute alcohol containing 1/50 NaOH, although their endotoxin had been to a large extent destroyed, still retained their specific agglutinogenic property.

A NOTE ON THE VALUE OF GERMINATED BEANS IN THE TREATMENT OF SCURVY, AND SOME POINTS IN PROPHYLAXIS.[1]

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I.—The Value of Germinated Beans in Treatment.

In the Journal of the Royal Army Medical Corps for August, 1917, Drs. Harriet Chick and E. Margaret Hume [1], describe the distribution among foodstuffs of the vitamines needed for the prevention of beriberi and scurvy. Having demonstrated by animal experiments that germinated pulses are richly endowed with anti-scorbutic vitamine, they make the following practical suggestion: "To prevent scurvy, if a supply of fresh fruit or vegetables is not procurable, germinated pulses should be added to the diet."

Many Serbian soldiers were treated for scurvy in this hospital in 1917, and when the disease became prevalent again this year an attempt was made to test the value of these germinated pulses in treatment. Unfortunately, no suitable seeds were forthcoming for some time. All the lentils supplied were decorticated, and so would not germinate; peas could not be obtained; and beans, though expected daily, took over a month to arrive. In the meantime over three-quarters of the clinical material, including all the best cases, had been admitted and treated by other means. After beans were at last received, comparatively few and slight cases became available for the test, but the results obained were so good, that they are worth recording.

Haricot beans were prepared according to the directions given in an appendix to the article quoted above. They were first soaked in clean water for twenty-four hours, and then placed in tin trays for forty-eight hours to germinate. Old ration biscuit tins, cut in half longitudinally and freely perforated with holes, were found serviceable for this purpose. They were easy to make and clean to handle; and each half held several pounds of beans, a day's dose for twenty-eight patients. Since germination takes about forty-eight hours at a temperature of 60° F., it can easily be carried out in Macedonia in May, when the mean temperature is 67° F. The whole process is very simple, the only essentials being that the seeds must be kept moist, but not shut off from free circulation of air. After germination, ten minutes' boiling was ample to fit the beans for eating.

In addition to general use for many patients, two wards, each containing

[1] Received for publication on November 21, 1918.

twenty-seven beds, were specially devoted to the purpose of comparing the therapeutic values of these germinated beans and fresh lemon juice. Scurvy cases were admitted to these two wards alternately, without selection. In one ward each patient was given four ounces of fresh lemon juice daily, the juice being expressed in the ward, sweetened slightly, and given as a measured dose by the sister. In the other ward each patient received a portion of germinated beans which had weighed four ounces in the dry state, half being taken at dinner, and half at tea. In respect of other forms of treatment, such as tonics and local treatment to the mouth, no difference was made between the two wards.

A certain amount of prejudice against the beans had to be contended with. Though perfectly good to eat, it cannot be said that they always looked appetizing, and some with a dark husk had a disagreeable sour taste. These disadvantages might have been masked by mixing the beans in a general stew, but it was thought better to serve them apart in order to ensure some accuracy of dosage, and, that the cooking should be limited to the shortest possible time. Apparently, however, the greatest difficulty was based on the fact that these beans are regarded as pig food by some Serbs, and this necessitated frequent explanation of their functions through an interpreter.

Since the cases were mild and presented but slight changes, it was not easy to make comparisons. In no case did fresh scorbutic signs appear after treatment was started, and, in many, local lesions were limited to the gums and the hair follicles. The degree of general cachexia present was not a safe criterion of the severity of the disease, because in many instances it was partly due to chronic malaria. Hair follicle changes are not a good guide to progress, since they always take many weeks to return to normal, however quickly the active tendency may be abolished. Alteration in the condition of the gums seemed to be the best index, although allowance had to be made for the presence of dental caries and previous pyorrhœa alveolaris.

In the special wards thirty patients were treated throughout with lemon juice, and twenty-seven with beans. Contrasting them as regards severity of disease at the commencement of treatment, those treated with beans were, on the whole, slightly worse. The difference would be too small to mention, save that it justifies the definite statement, that the bean cases were certainly as severe as the lemon cases. Comparing the results of treatment there is a small but definite difference in favour of those treated with beans, 70·4 per cent being cured within four weeks, as against 52·4 per cent of those treated with lemon juice. These figures favour the bean cases unduly, the real difference being better expressed by the time taken for the gums to return to normal, which was 3·1 weeks for bean cases and 3·4 weeks for lemon cases.

In another series of twenty-one cases beans were not given until the patients had failed to make satisfactory progress after an average of four

weeks' treatment in hospital by other means. These, although they had shown themselves rather refractory to ordinary treatment, all showed acceleration of progress when put on the beans, and in some the difference was very marked. For example, Case 17, aged 51: No previous scurvy. Patient had suffered from symptoms of scurvy, sore gums and pains in the legs, for three weeks before admission to hospital at——. He was transferred to this hospital after twenty-five days' treatment at ——. On admission his gums still showed marked swelling and tendency to bleed, but there was no dental sepsis to delay healing. The hair follicles on the front of the legs and thighs showed a few fresh petechial hæmorrhages. There were no big muscle or joint hæmorrhages. General anæmia was marked. After twenty-six days' further treatment with four ounces of lemon juice daily, local treatment to the gums by hydrogen peroxide and tincture of iodine, and administration of an iron and arsenic tonic, so little improvement was seen, that the treatment was changed by the simple substitution of the lemon juice by four ounces of germinated beans. In five days definite improvement was apparent, in thirteen days the gums were noted as practically normal, and in twenty days as quite normal.

These clinical results then confirm the experimental results of Drs. Chick and Hume; and permit the definite conclusion that dry beans develop, upon germination, an amount of antiscorbutic vitamine at least equal to, if not greater than, that contained in fresh lemon juice.

II.—Deductions from Considerations of the Rations upon which our Patients became Scorbutic.

(*a*) *Meat.*—Of 132 cases of scurvy whose previous diet was investigated last year all had received a ration of frozen fresh meat practically every day; and of 175 investigated this year very few had received it less than three times a week. Fresh raw meat is known to contain a small amount of antiscorbutic vitamine. To what extent freezing and subsequent cooking are respectively responsible for the destruction of this vitamine remains uncertain, but it is obvious that between them they render meat practically useless as an antiscorbutic. In the case of tinned meat the vitamine seems to be completely destroyed by the temperature needed in the process of tinning, so that for practical purposes the meat supply of troops in the field must be regarded as totally devoid of antiscorbutic properties.

(*b*) *Lime Juice.*—In the past lime juice had a well deserved reputation as an antiscorbutic. The vast majority of the patients admitted to this hospital had never received a single dose. Three, however, were exceptions, having developed scurvy after taking a small quantity every day for a month. These become significant in conjunction with the fact that Drs. Chick and Hume found by experiment that modern preserved lime juice has but feeble antiscorbutic power, and suggests that it would be unwise to place too much reliance upon modern supplies for prophylaxis. Probably,

as suggested by Drs. Chick and Hume, the lime vitamines are destroyed by modern methods of manufacture.

(*c*) *Fresh Fruit.*—According to their own statements, not one of the patients seen this year, or last year, had received any fresh fruit previous to admission to hospital. Oranges and lemons become available in the early spring; but, even when a sufficient quantity can be obtained, they are difficult to store and transport, owing to their bulk and perishable nature. This difficulty seems to have prevented them from reaching the troops at the front last year, and would operate in the same way in future. Further, these fruits cannot be obtained in sufficient quantity in the early months of the winter, the time when they are most needed to combat the early stages of vitamine deficiency.

(*d*) *Vegetables.*—In the last two winters, the vitamines received by scurvy patients before admission to hospital had been limited to those contained in potatoes and onions, with the addition, late in the season, of spinach. The potatoes, when issued, were always greatly diluted with rice, so that the amount received by each man was very small. This year out of 175 patients 101 stated that their weekly allowance of vegetables had been one, or at most two, issues of potatoes with rice, and one issue of onions. Most of these were admitted early in the season. Fifty-eight men, most of whom were admitted rather later, had fared better, receiving potatoes with rice twice a week, onions once or twice a week, and spinach once or twice a week. This should be a fairly generous supply of vitamine, but the fact remains that these men became scorbutic.

Sixteen patients were of special interest because their diet for a month before admission should have contained sufficient vitamine not merely to prevent scurvy, but actually to cure it. Eleven of these had received "plenty" of onions daily, most of them having also had potatoes with rice twice a week and spinach twice a week. Two, in addition to the above had also received a small dose of lime juice every day, and the remaining three had received spinach every day. Now onions, potatoes, and presumably spinach, are very rich in antiscorbutic vitamine in the raw state. Granted that these men may have reached a serious stage of vitamine deficiency before their diet became so generous, the fact that they did develop scurvy on the above diets is difficult to explain, except on the assumption that nearly all the antiscorbutic vitamine of the vegetables must have been destroyed in the process of cooking. This point is referred to later.

III.—Conclusions Regarding Preventive Measures for the Winter.

(*a*) *Preventive measures should be commenced not later than the end of November, and should be continued through the whole winter.* It is essential to remember that the occurrence of the first case of scurvy in an army does not mark the beginning of vitamine deficiency. There is a

prescorbutic stage, comparable to the incubation period of infective disease, during which, although the troops may appear to be in excellent health, they are in reality far from physically fit. In the case of troops rationed as the Serbian front line regiments were during the last two winters the duration of this stage probably varies between two and four months. Apart from the possible occurrence of clinical scurvy later on, so long as an army is in this prescorbutic stage of vitamine deficiency, it is in danger of breaking down from various causes, such as extra physical stress, exposure to severe weather, or the presence of epidemic infections. In other words, an army deficient in vitamine is an army of deficient vitality, although, until recognizable scurvy actually breaks out there is nothing to demonstrate the fact, and serve as a warning.

During the last two spring seasons scurvy was sufficiently prevalent amongst Serbian troops to show that the Serbian army as a whole was suffering from this vitamine deficiency to a serious extent. Clinical scurvy appeared in November and continued until May. Vitamine deficiency must have commenced in November and continued until May, so that, in any army placed under similar conditions in the future, preventive measures should begin not later than the end of November and be continued throughout the winter.

(*b*) *The destruction of antiscorbutic vitamine which takes place in cooking must be avoided as far as possible.* The exact mechanism of this destruction is not known, but it is generally allowed that vegetables lose antiscorbutic power when cooked, and some of our patients mentioned above afford clinical proof of the fact. Simple heat, and altered chemical reaction, are both under suspicion as to the destructive agents. Drs. Chick and Hume quote an experiment which shows that cabbage leaves lose half their antiscorbutic power when boiled for half-an-hour, but more experimental data dealing with this point are needed.

Recently Harden and Zilva [2] have shown that the antiscorbutic principle of orange juice is rapidly and permanently destroyed when the juice is made $\frac{N}{20}$, or $\frac{N}{50}$, alkaline with caustic soda, and they suggest that any cooking entailing alkalinity will injure the antiscorbutic potency of the substance cooked. Army cooking of vegetables does not entail alkalinity, some salt is always added to the water in which vegetables are boiled and this may be either "issue" salt or salt in which bacon has been packed. In distilled water both of these give a solution which is neutral to litmus, and is certainly not alkaline to phenolphthalein. A raw potato is acid to litmus, and it remains acid when fully cooked. The water in which potatoes have been cooked remains neutral. Onions are acid when raw, and not only remain acid when fully cooked, but impart a definitely acid reaction to the water in which they have been boiled. The same is true of germinated beans. These also, not only remain acid when cooked, but impart some acidity to the water in which they have been boiled. In consequence the question of alkalinity produced by cooking does not exist as far as army

methods are concerned; and, in the present state of our knowledge, it will be safe to regard heat as the destructive agent, and to reduce the heating of all vegetables to the absolute minimum required to make them digestible.

The reduction of raw potato to the condition of a digestible cream would be too difficult to carry out on a large scale without the provision of some special apparatus of the type of a "Hercules Press"; but, small quantities of onion and spinach would be sufficiently digestible if chopped, or minced, into fine particles. If thoroughly mixed with a stew at the completion of cooking, these vegetables should be well taken in raw state, and would add very greatly to the antiscorbutic value of the diet.

(c) *The addition of some fresh vitamine-containing substance being needed, germinated pulses, as suggested by Drs. Chick and Hume, would provide the easiest and cheapest method of effecting this addition.* As shown above modern lime juice is not to be trusted as an antiscorbutic, and fresh fruit, and vegetables (in the quantities available), have failed to prevent scurvy for two years in succession; but germinated haricot beans, even when fully cooked, contain at least as much vitamine as fresh raw lemon juice. Other pulses which might be germinated, and would probably give as good a result, are: peas, beans of any variety, and unmilled lentils. It only remains to show that it would be practicable to provide these for troops in the field.

In this country germinated pulses would only be required during the winter, a season which has the disadvantage of necessitating the provision of some artificial heat to ensure germination. This disadvantage is counterbalanced by the fact that the movement of troops is lessened during the winter months.

The advantage of these dry seeds over all other forms of fruit and vegetables, both for storage and transport, are obvious. Since they double in weight and bulk, and require to be kept moist when germinated, this process should be carried out as near the site of consumption as possible. In stationary trench warfare it should not be necessary to attempt germination in the actual front line, because the supply of vitamine by this method is so generous that it would suffice for preventive purposes if given every other week, or every other fortnight, when the troops were in rest. Should, however, a battalion be compelled to stay in the front line for longer than a fortnight, it would not be difficult to supply it with pulses already germinated, since at most two hundredweight (100 kilos) per day would be needed for 1,000 men, and this weight represents so much food transported as well as so much vitamine.

In the case of a war of movement, local conditions and temporary needs and opportunities would have to be considered as they occurred, again always keeping in mind the fact that the supply need not be continuous for preventive purposes, and that these pulses provide their full value of food as well as their supply of prophylactic vitamine.

As regards germination, the preliminary soaking for twenty-four hours can be done anywhere. For germination itself the essentials are moisture, and protection against cold, but without the exclusion of air. The rate of germination varies with the temperature and the type of pulse. Seeds were not obtained here until too late to test them in cold weather, but, judging by the season at which peas and beans are sown in England, no cold short of definite freezing would arrest the process completely, though it would of course lengthen the time required for growth to take place. Hence, if facilities are lacking for keeping a supply in process of germination, the time taken must be shortened by the provision of artificial warmth.

The space required, and needing to be kept warm, is very small. Allowing two ounces per man per day, a dose which should be ample for prophylaxis, a day's supply for 1,000 men could easily be accommodated in a space of thirty cubic feet. On an average of three days for soaking and germination, this means that a space of 100 cubic feet would suffice to provide a continuous supply for 1,000 men.

In Salonika, during the three cold months, December (mean temperature 46° F.), January (mean temperature 42° F.) and February (mean temperature 45° F.), artificial warmth would be essential. For this a building or tent would be a great advantage; but failing this, the necessary warmth might still be obtained by means of a hotbed, anywhere within reach of fresh horse or mule manure. During November (mean temperature 52° F.), and March (mean temperature 50° F.), germination could be carried out in the open without artificial warmth, provided that some protection were given at night and during spells of bad weather. A few boxes and some old sacking would provide all the protection needed.

The beans soften so much in the process of germination that ten minutes boiling is ample to cook them fully. If crushed or pounded they can be eaten raw, but this should rarely be necessary unless the supply ran short.

Allowing for the fact that beans are food, and lemons are not, the vitamine supplied by the former are really obtained almost free of cost. Even if no allowance is made for the food value of the beans, the cost of vitamines supplied by them would still be only 60 per cent of the cost when supplied by lemons.

General Conclusion.

The statement of Drs. Chick and Hume, that germinated pulses are richly endowed with antiscorbutic vitamines, is amply confirmed by the fact that germinated beans were found quite as potent as raw lemon juice in the treatment of scurvy. Their suggestion, that germinated pulses should be used for the prevention of scurvy, is capable of practical application; and would be the easiest and cheapest method by which to prevent the occurrence of scurvy in an army in the field.

In the case of vegetables cooked in the army manner, the destruction of vitamine which takes place cannot be ascribed to the production of alkalinity.

In conclusion, my thanks are due to Lieutenant-Colonel A. R. Greenwood, R.A.M.C., for permission to publish these cases, to Miss M. J. Ahern for careful clinical notes, and also to Quartermaster-Serjeant Andrews, R.A.M.C., for constant supervision of the germination and cooking of the beans.

[1] HARRIET CHICK and E. MARGARET HUME: "The Distribution among Foodstuffs (especially those suitable for the rationing of armies) of the Substances required for the Prevention of (*a*) Beriberi, and (*b*) Scurvy." JOURNAL OF THE ROYAL ARMY MEDICAL CORPS, vol. xxix. No. 2, August, 1917, p. 121.

[2] A. HARDEN and S. S. ZILVA. "A Note on the Susceptibility of the Antiscorbutic Principle to Alkalinity." *Lancet*, cxcv, September 7, 1918, p. 320.

Clinical and other Notes.

NOTES ON THE USE OF BRITISH AND INDIAN TROOPS BARRACKS FOR HOSPITAL PURPOSES.

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The utilization of various public and private buildings for hospital purposes was a problem which so constantly presented itself to medical officers during the Great War, that it is a matter for surprise that none of those who have had to solve such problems have, as far as I am aware, published any notes on the subject in the Journal of the Royal Army Medical Corps.

A similar problem presented itself in Northern India in 1919, in connexion with the Afghan Campaign, and I venture to think that these notes, made from a scheme worked out for the utilization of certain barracks in Sialkot, by Lieutenant-Colonel G. B. Riddick, R.A.M.C., and Major P. H. Kealy, R.E., may be of use to officers in the Corps.

Before describing the scheme in detail, I would draw attention to certain duties and responsibilities which devolve upon the A.D.M.S. of a divisional area.

(1) In every station in which it is proposed in time of war to locate general hospitals on the lines of communication in barracks, the necessary plans should be prepared in anticipation. These plans should include estimates as to the necessary materials required to carry out alterations and additions to barrack buildings, the cost of the same, and the time required to complete the work.

(2) A committee consisting of a Senior Medical Officer (R.A.M.C. or I.M.S., according as to whether the barracks are to be used for a British or Indian general hospital), the A.C.R.E. and the D.A.D.M.S. (Sanitation) should be assembled to formulate the plan described in para. 1.

(3) The complete plan should be submitted to the A.D.M.S. of the Division, who, if he approves of it, will forward it through the divisional Q branch to the divisional C.R.E. From thence, if passed, through Q branch of the Command Headquarters for scrutiny and approval by the D.D.M.S. and Chief Engineer, and then finally to the Quartermaster-General at Army Headquarters.

(4) When finally approved by the D.M.S. in India, Director-General Military Works, and Quartermaster-General the plan will be returned to the Command Headquarters, where copies of the finally approved plans will be filed in the office of the D.D.M.S., Q Branch and the Chief Engineer, spare copies being made for issue to the Divisional A.D.M.S. and C.R.E. should necessity arise.

(5) The authority to commence work will be issued by wire by the Quartermaster-General in India to the Command concerned who, when forwarding the authority, will issue copies of the plans to the divisional A.D.M.S. and C.R.E.

(6) The officer detailed to mobilize and open a general hospital will thus be placed in possession of a definite, previously elaborated plan for utilization of the barracks allotted for hospital purposes. This is most important, as in the

majority of instances he will be an officer from another station, with no previous knowledge of the station in general or the barracks in particular.

(7) In addition to the above plan, the divisional D.A.D.M.S. (Mobilization) will prepare, in advance, complete instructions to be handed to the officer detailed to open a general hospital in the divisional area. These should include: General instructions as to position of various offices and stores, transport lines, etc.; accommodation in the station for officers, assistant surgeons and other ranks; transport, where obtained, etc.; equipment, where stored, weight of same, indents for, etc.; personnel, from whence detailed, reports as to arrival, documents to accompany in the field; methods of pay; making of family allotments, etc., etc.; progress of mobilization reports; imprest accounts; entrainment arrangements; office records and returns; reinforcements; replenishment of stores; Red Cross equipment; demobilization.

(8) The barracks selected for utilization as a general hospital should be, as far as possible, those in immediate proximity to the existing British or Indian station hospitals, these hospitals being taken as the nuclei from which the general hospital is administersd, and around which the actual bed accommodation is grouped. Even when thus arranged it will be found that the extensive area over which the blocks of barracks are scattered will add much to the difficulties of administration, and necessitate a very much larger scale of personnel of all descriptions, than generally authorized in Field Service Manuals and War Establishments.

(9) Taking the average accommodation in barracks for an Infantry Battalion in India, it will seldom be found that accommodation for more than 600 beds can be arranged, the remaining buildings being required for offices, pack stores, dining rooms, recreation rooms and many other purposes described later.

The average accommodation of a British or Indian station hospital being taken at 200 beds, we arrive at an 800 bedded unit, which should be the maximum size for a general hospital.

Taking the above as our model I will proceed to describe in detail the planning of such a hospital:—

(1) *Ward Accommodation* (for fifty officers and 750 other ranks).—The 200 beds usually available in British and Indian station hospitals should be utilized first for surgical cases in proximity to the existing operating theatre, and next for serious medical cases, the ratio of surgical to medical cases, when troops are operating under tropical conditions, will be as one to twenty-five at least, very possibly the proportion of medical cases will be much higher.

The remaining 600 beds must be located in barrack rooms, the average accommodation being about 125 per barrack block. Each block should be as far as possible a self-contained unit with its own medical officers, sisters, nursing orderlies, etc., who should be changed as seldom as possible. As a rule there are N.C.O.s' bunks in each barrack block, which should be utilized as follows: (*a*) sisters' room; (*b*) assistant surgeon's room, where all case sheets and other documents are kept, and minor dressings can be done; (*c*) scullery, with a sink and cupboards for crockery, cutlery, etc.; (*d*) milk storage room. The most isolated block should be set aside for infectious cases of the enteric and dysentery group. It should be self-contained as regards cooking, ablution and latrine arrangements. The necessity for providing separate blocks for diseases such as

dysentery and those of the enteric group must not be forgotten in planning the hospital.

(2) *Receiving Room.*—An "In and Out" road in connexion with this block is an essential; it must be suitable for mechanical transport, and must be specially made if necessary. The surface must be good, and should be treated with a mixture of tar and oil to keep down the dust. The block should be capable of accommodating fifty stretcher cases and 100 sitting cases, in addition to space required for the necessary clerical and medical personnel, including a quarter for the O.M.O.

(3) *Pack Store.*—This should be near the receiving room. The requisite shelves and ladders will always have to be made, and an indent for the necessary structures should be sent to the Military Works Department as soon as possible.

(4) *Quartermaster's Office and Stores.*—The various storerooms required will include those for (*a*) bedding and hospital clothing; (*b*) meat and vegetable store, which should be well ventilated and fly proof; (*c*) steward's store; (*d*) fuel store; (*e*) oil store and lamp room; (*f*) soiled bedding and clothing store; (*g*) ordnance stores.

(5) *Dispensary and Medical Equipment Store.*

(6) *Offices.*—Commanding officer's office, registrar's office, clerk's office, matron's office: all these should be in the same block. A telephone should be installed in the registrar's office, linking it up with brigade or divisional headquarters and the railway station. If a local exchange can be arranged establishing communication with the quartermaster's office and the garage this will save much time and energy.

(7) *Accommodation for Patients other than Wards.*

(i) Dining rooms: (*a*) for officers, (*b*) for other ranks.

(ii) Recreation rooms: (*a*) for officers, (*b*) for other ranks. These should include a room large enough to accommodate at least 300 patients at a time, with a stage for concert-parties, etc., or cinematograph entertainments. A library should be installed, as the purchase of books is authorized.

(iii) Cook houses. The ordinary company cook house in barracks will be utilized for cooking all food required by patients confined to bed, one such cook house will usually be available for each ward block. In addition, (*a*) one cook house must be set aside for the preparation of meals for the officers' dining room; (*b*) one cook house must be set aside for the preparation of meals for the men's dining room. This cook house will always require certain structural alterations and additions, including a fly proof food store and special arrangements for washing up food utensils. Extra cooking stoves will be required. As an indication, one Class B Warren's stove will cook for about 150 patients. Soyer's stoves are also extremely useful for cooking vegetables.

(iv) Bath room and lavatories. A central bath room fitted with twelve long baths and an efficient hot water apparatus is a necessity. Spray baths are as efficient and more economical in water than other forms. Lavatories: The barrack wash-houses, one to each block, will be utilized. They should be fitted with tip basins and one long bath in each wash-house.

(v) Latrines. The usual wooden seats with earthenware gumlahs beneath are not ideal for hospital purposes. Oil drums with removable, lidded, wooden seats are preferable. These need only be emptied once every twenty-four hours, the

contents being incinerated. Each latrine should be provided with a fly proof cabinet capable of holding six to eight bed pans and urine bottles.

(vi) Urinals. Trough urinals treated with heavy oil and tar are generally satisfactory. Where the soil is suitable they may empty into soakage pits, otherwise into bedded tubs, the contents of which are emptied into Croly carts for removal daily.

(vii) Incinerators. (*a*) For excreta: Various types are in use in India, and are fully described in "Field Service Sanitary Notes, India." For a hospital of the size described in this paper, a special incinerator will be necessary, and one with a chamber for drying litter is recommended. (*b*) For refuse: a beehive incinerator for this purpose in proximity to the above will be necessary.

(viii) Disinfectors. Thresh disinfectors are authorized, two will be required. If this pattern is used, a concrete base for the apparatus to stand upon and some form of roof protection are necessary; also rooms with concrete floors for storing undisinfected and disinfected clothing—these must be provided with lock-up doors to prevent pilfering. A hand cart lined with tin or galvanized iron, and with lids capable of being fixed with a padlock, is essential for conveyance of clothing to the disinfector.

(ix) Laundry or Dhobi's Ghat. Steam laundries are authorized in every station in India where there are first class British and Indian station hospitals, in accordance with A.I.I. 222 para. XIV. As it is more than probable that such will not be built for many years to come, the ordinary dhobie ghat will have to be utilized, but a special one for the hospital must be constructed.

(x) Operating Theatres. The operating theatre already in existence for the station hospital will be utilized for clean cases, an operating theatre for septic cases will have to be improvised, and an existing building should, if possible, be selected which can be suitably altered and equipped with basins, sinks, etc., by the Royal Engineers. An up-to-date X-ray plant should be installed in the vicinity.

(xi) Mortuary. A suitable building for this purpose must be selected.

(8) *Water Supply.*—Twenty gallons per head per day (including personnel) should be allowed for, for all purposes. The Royal Engineers should be asked to lay on water to all bath rooms, lavatories, dining rooms, and cook houses.

(9) *Artificial Lighting.*—The ideal is to be aimed at, viz., an electric plant which is capable of providing current for running electric light and fans throughout the hospital. Failing this there should at least be an electric plant capable of providing an efficient light in the main operating theatre. The same plant can be utilized for working the X-ray apparatus.

(10) *Bacteriological Laboratory.*—The existing brigade or divisional laboratory which is nearly always near the station hospital should be utilized. Should there be no laboratory a suitable building must be selected and equipped. Probably slight structural alterations will be required to ensure a good light for microscopical work.

(11) *Transport.*—Owing to the scattered location of the hospital blocks, and the fact that it will probably be necessary to house the lady nurses in various bungalows in cantonments, the following transport will be required:—

(*a*) Motor transport for conveying the nursing staff to and from their duties.

(*b*) Two Ford box cars for drawing and distributing rations, ice, mineral waters, Red Cross stores, etc. Garage accommodation for the above must be provided.

(12) *Ambulance Train Accommodation.*—A special siding for loading and unloading ambulance trains must be set apart for this purpose. If not available, one must be made. The platform should be wide so as to allow the provision of suitable shelter for stretcher cases, and of separate shelters with seats for walking cases. Arrangements must be made for the arrival and departure of motor ambulance cars, by means of an "In" and "Out" road. In the immediate neighbourhood the following will be required: (1) An office for the entraining medical officer; (2) a store in which medical and surgical equipment, ordnance equipment, and S. and T. supplies of all sorts can be located. The parking of ambulance trains must be arranged for by the railway authorities.

(13) *Housing of the Hospital Personnel.*—Suitable accommodation must be found either in barracks or bungalows. Arrangements will be required for the housing, messing, and recreation of the following: Medical officers, nursing sisters, assistant surgeons, sub-assistant surgeons (in the case of Indian general hospitals) British orderlies, and attached men, S. and T. personnel, Indian hospital storekeepers, Indian hospital establishment belonging to the Army Hospital Corps and Army Bazzar Corps Indian followers.

INFLUENZA: PRELIMINARY NOTE ON A FATAL PNEUMOCOCCAL INFECTION AND ITS SUGGESTED SPREAD FROM SHEEP TO MAN.

By Major J. MACKENZIE.
Royal Army Medical Corps.

In October, 1919, a severe and fatal epidemic of "influenza" attacked several corps of Indian followers in Lahore Cantonment. The illness set in with the usual symptoms of pyrexia, coryza, cough, pains in body and limbs, etc., and in a very large percentage of cases terminated fatally, often with signs and symptoms of broncho-pneumonia. The first death occurred on October 11. There was one death per day from October 15 to 19, and on the 21st five deaths occurred.

The sputum of patients contained various combinations of organisms, diplococcus, catarrhalis, pneumococci, staphylococci, streptococci in a few and (?) Hoffmann's bacillus in a few. Pfeiffer's influenza bacillus has not been found in the sputum, nor has it appeared in cultures on Levinthal's blood agar.

Up to November 19 the admissions were 689 and deaths 196.

No marked difference in symptoms and progress was observed between this epidemic and that of last year. But a very remarkable difference existed in the fact that this year in all the Punjab and in all India—so far as known—there was no other sharply localized and fatal epidemic of this nature. Still more remarkable was the fact that the units attacked—in the first weeks at least—were all located, some in barracks and some in camp, at the north end of the cantonment. No explanation of these facts suggested itself, and one felt completely baffled in trying to trace the source of infection.

On November 19, while visiting the cattle depot in connexion with some questions regarding buildings, etc., I was told that a large number of sheep were dying of a mysterious malady and that this had been going on for several months. I asked to see some of the sick sheep and was taken to the sick pens where a

number of sheep were collected. Some of these were standing up eating hay from a trough; others were lying on the ground with head up and still munching at the hay. I was told that these would not get up again but would die within twenty-four hours; others were lying dead on the ground. As a sheep expired several ounces of liquid—often blood-stained—exuded from the nose and mouth, and small pools of this were seen beside the heads of the dead sheep. I was informed that the nature of the malady had not been determined, but that it had been attributed to overcrowding, insufficient water and unsuitable food; blood films had been taken and found negative.

As the sheep pens were located in the northern part of the cantonment and close to the lines of some of the influenza-infected units, it seemed worth while to go more deeply into the matter. A newly-dead sheep was removed to my laboratory and a post-mortem examination made. On opening the thorax the pleuræ were found adherent in many places, with excess of fluid in the pleural cavities. The lungs showed irregular patches of hepatization and the lobes were glued to each other with lymph.

Smears and cultures were made from the lung-juice and from the heart-blood. Having seen the condition of the lungs one hoped to find pneumococci in the lung smears, and this was found to be the case. Stained smears showed in every field several Gram-positive capsulated diplococci indistinguishable from Fraenkel's pneumococcus.

The heart-blood was also found to contain the same organism in considerable numbers, one or two in almost every field. Death appeared to be due to pneumococcal broncho-pneumonia + toxæmia + septicæmia. These results were very suggestive, and a relationship between the sheep epidemic and the human epidemic appeared now to come within the range of possibility. Statistics of sheep mortality in the cattle depot were obtained, from which it appeared that about 10,000 sheep had died there since the beginning of August. So intense was the epidemic that at one time 400 sheep had died in a single day in August, but this included a certain number drowned during heavy rain.

During August 3,500 sheep died in a total of 15,000. During September, in an average flock of 12,500 sheep, about 3,700 died, and a correspondingly large number in October.

In the week ending November 13, 223 sheep died in a flock of 1,353.

The unit nearest to the sheep pens consisted of the personnel of the cattle depot itself. The next unit in point of nearness was the 111th Labour Corps. The personnel of this unit consisted of Madras coolies, and their barracks were separated from the sheep pens by a main road running north and south through the cantonment. During the rainy season, July to September, the roads are free from dust, but after the rains have ceased, the superficial layers of the soil become pulverized into a fine light powdery dust; after the passage of a motor vehicle or a flock of sheep or even a bullock cart, a dense cloud of dust rises about twenty feet, and hangs in the air, gradually disseminating itself in every direction.

A very large quantity of dust from the road and from the sheep pens opposite must have found its way into the barracks and lines of this unit. It also appears that sheep from this flock when passing along the road strayed into lines and compounds on either side, and many were found dead in such places.

This labour corps had sixteen cases of fever and catarrh admitted to hospital

in September, more than any other unit. In October the cases increased in number and severity. There was one death on each day from October 15 to 19, and one on the 21st.

On October 21 cases were first notified as influenza. From October 22 to 28, sixty cases and sixteen deaths occurred in this unit.

The other units from which cases were admitted at this time were the men of the cattle depot itself, and a few cases from two units located over a mile away to the west; these last acquired the infection while in hospital, the hospital now becoming a secondary focus of infection.

Another unit appeared on the returns on October 25, viz., the 14th Labour Corps, encamped over a mile away on the east side of the cantonment. As this unit was also composed of Madras coolies and now became heavily infected, it was suggested that the infection had possibly been brought in by a recently arrived draft from Madras, which had a large number of infected areas, while the Punjab had none. It now appears that on and after October 10 a fatigue party of fifty-two men from this unit was sent to work daily at the cattle depot in erecting sheep pens.

A second newly-dead sheep was post-mortemed on November 21, with results exactly similar to the first. Pure cultures of pneumococci were obtained from the lung-juice.

On November 22 I held a post-mortem examination of a patient who had died of influenza. (By this time several deaths were occurring daily.) Jaundice was present. On opening the thorax extensive adhesions of the pleuræ were found, with much yellowish-grey flaky lymph. In each lung the lobes were glued together into one single congested mass. Large patches of hepatization were found in both lungs, the lower lobe of the left lung being almost completely solid.

The pericardial sac contained a quantity of yellow-grey liquid, the whole membrane, parietal and visceral, being covered with a rough layer of lymph giving it a tripe-like appearance.

Scrapings from the pericardial sac when stained and examined were teaming with pneumococci in extraordinary numbers. Films and cultures were made from the lung-juice, some of which was also inoculated subcutaneously into a rabbit. In all the films and cultures pneumococci alone were present, and the inoculated rabbit died in thirty-seven hours with its heart-blood teeming with pneumococci.

Broncho-pneumonia, pericarditis, toxæmia and septicæmia had all played a part in this case.

Films of finger-blood from three seriously ill cases were then taken, as also from one case that had just ended fatally. In all of these pneumococci were found in fair numbers.

A second post-mortem on an influenza patient on November 25 showed patches of lung consolidation with some pleuritic adhesions. All other serous membranes and organs were apparently normal except the spleen, which was enlarged and congested.

Smears were taken from lung, heart-blood, spleen, liver, kidneys, and meninges, and in these pneumococci were found; the meningeal smear in particular was crowded with the organism.

The two subjects for post-mortem examination were not selected in any way but were chosen at random.

The investigation is far from complete, but as facts and figures are sifted and examined the evidence points more and more to the conclusion that in this epidemic the fatal pneumococcus invasion spread from sheep to man.

It need hardly be said that on November 19, after the first sheep post-mortem, steps were at once taken to have the whole flock removed to a distance, all sick sheep destroyed and burned and the whole area disinfected.

The pneumococcus has been found by many observers in blood cultures in a percentage of influenza cases, but not (as far as information goes) in every case in any epidemic.

In the present case it would appear that a type of pneumococcus, rendered highly virulent by passaging through sheep, has either grafted itself on to cases of mild "influenza" or has by itself produced the very fatal type of disease here described. The admissions amongst Indian troops and followers up to November 27 were 754 and the deaths 230. Many points have still to be cleared up.

The presence of maggots in the nostrils of the sheep suggests that flies carry the infection from sheep to sheep even when there is no dust, as during the rainy season; but probably the most usual method of infection would be by contact. From sheep to man the infection might be by flies and dust, or by direct contact; and from man to man by coughing, sneezing, etc. There is plenty of proof that the disease is extremely infectious.

Treatment does not perhaps come within the scope of these notes (although treatment and prohylaxis are often closely bound up together and too frequently divorced), but the finding of pneumococci in the blood of all the cases suggests that the intravenous injection of non-toxic antiseptics such as eusol and flavine might be of benefit.

It is in the beginning of an epidemic that the key is to be found: when and where did the Spanish disease of 1918 first begin?

A CASE OF ACROMEGALY.

By Captain D. R. THOMAS.
Indian Medical Service.

This man was a Turkish prisoner of war, embarked at Rangoon on June 17, 1920, as a case of convalescent dysentery for repatriation on H.M.A.T. "Varela."

Personal History.—No. 6803 Private Kadir Ali, Turkish prisoner of war, aged 36, with fifteen years' service as a regular soldier. He is married, with two children, a girl aged 8 and a boy aged 5.

Duration of Complaint.—He states that he has always had big hands and feet from childhood, and that his father and brother are also equally well developed. He never noticed that his boots were becoming too small for his feet.

Family History.—Father and mother, aged about 55 respectively, both alive and well. Father is a boot-maker, about six feet in height, with enormous hands and feet, and has won fame as a local wrestler. He has a brother, aged 17, living, also with big hands and feet, whilst five brothers died young, cause unknown.

Personal Habits.—Environment, Turkish barrack life; appetite, very good; smoking, very heavy; alcohol, total abstainer (Mussulman).

Previous History.—One attack of dysentery in 1919, now completely cured, Never had any accidents.

General Appearance of Patient.—His general nutrition was good, with average intelligence. On walking he exhibited a waddling gait. Head: enlarged in the occipito-mental plane. Ears: hypertrophied. Face: massive and elongated, and increased in proportion to the head. Chin: very prominent. Lower jaw: protruding, elongated and thickened with a very obtuse mandibular angle. Lower lip: thickened and pendulous. Teeth: the lower incisors are separated and small, and as the lower alveolar wall protrudes, the bite with the upper incisors is incomplete. When the mouth is fully closed, the lower incisors project ½ inch in front of the upper. Nostrils: large and broad. Superciliary ridges: slightly

Fig. 1.

Fig. 2.

enlarged. Eyes: Sight good, with no bitemporal hemianopsia. Tongue: large and flabby, with thickened speech and deep voice. Hands: increased in thickness more than length. The palms are soft and paddy and the palmer lines deepened. Grip: very feeble for such a powerful looking hand. Nails: very broad and large, but no curving. Arms: not affected. Feet: uniformally enlarged, specially the big toes. Spine: no dorsal kyphosis. Skin: coarse and flabby.

The Turkish interpreter described him as resembling a bear from his waddling gait, protruding chin, big nose, with large hands and feet. It is a very good comparison.

Minute Examination of Affected Parts.—Height, 5 feet 2 inches; weight, 10 stone; chest, 36½ inches, and 38½ inches (expanded). Hands: span, 9¾ inches; circumference of palm, 10 inches; circumference of closed fist, 13 inches; circumference of wrist, 8 inches; circumference of ball of thumb, 3½ inches. Feet: circumference of foot impression, 26 inches; circumference of foot at instep, 12¾ inches; circumference above ankle, 6 inches; circumference of ball of great toe, 4¾ inches; greatest length of foot, 11 inches; greatest width of foot, 4¾ inches. Head: circumference in occipito-mental plane, 28 inches; circumference in occipito-frontal, 23 inches. Nose: length, 3 inches; depth (tip of nose to naso-malar groove), 1¾ inches. Ear: longest axis, 3 inches; widest axis, 1½ inches; uppermost margin of ear to chin, 8 inches; lobule of ear to chin, 6 inches.

Considering the relative proportion of weight to height in this patient, the abnormality in growth in the above-mentioned parts is very striking, as may be seen from the above photographs,

I am indebted to Major Mearns, I.M.S., O.C. Troops, H.M.A.T. "Varela," for permission to publish this interesting case and to Mr. Witchell, the Chief Officer of the Ship, for the above excellent photographs.

REMOVAL OF A RIFLE BULLET FROM THE BRONCHUS.

By Major A. G. WELLS, D.S.O.
Royal Army Medical Corps.

The following case seems worthy of record:—

A. B., aged 6, was admitted to the Cambridge Hospital, Aldershot, one evening with a history of having "swallowed" a bullet which he had found while playing on the rifle range. With the exception of being somewhat frightened he displayed no symptoms and was accordingly ordered to bed by the orderly officer for observation.

I saw him the following morning, when he complained of pain in the upper part of the left chest, with some spasmodic cough, which became worse when he lay down. There was no respiratory distress; on percussion there was marked dullness over the left lung back and front, and auscultation elicited very marked diminution of air entry on that side. He was taken to the X-ray room where I screened him. A rifle bullet could be seen lying almost vertically, nose downwards at about the level of the second intercostal space on the left side. I judged it to be in the left bronchus and this conclusion was practically confirmed by examination of the X-ray plates which were taken.

The question of the use of the bronchoscope was discussed and abandoned and at 2 p.m. that afternoon, assisted by Captain Law, R.A.M.C., I operated under general anæsthesia. The trachea was opened by the low tracheotomy route and a probe passed down into the left bronchus. About one inch from the bronchus metal was encountered. Long sinus forceps, curved laterally, were passed down but I was unable to secure a hold of the bullet with them. Eventually a pair of aural forceps curved in two directions was passed, and after a little difficulty I managed to grasp the bullet and extract it. A fair amount of bleeding occurred

after withdrawal, doubtless due to the unavoidable injury I had occasioned to the lining of the bronchus. A tracheotomy tube was tied in position and the wound sutured above and below the tube.

The boy's condition was critical for a day or two owing to the collapse of the lung, but no bronchopneumonia ensued and when I last saw him, the lung was gradually expanding and he was well on the way to convalescence, the tube having been removed on the third day.

I think the case is of considerable interest, especially when one considers the relative size of the modern rifle bullet and the calibre of the bronchus of a child of this age.

I am indebted to Captain Foster, R.A.M.C., for the skilful way the difficult anæsthetic was administered, and also to Lieutenant-Colonel H. C. R. Hime, D.S.O., for permission to publish the case.

THE MECHANISM OF PASSAGE OF OVA THROUGH THE TISSUES IN SCHISTOSOMIASIS.

By Major H. Marrian Perry.

Royal Army Medical Corps.

Assistant Professor of Pathology, Royal Army Medical College.

There have been many opportunities for the study of the different aspects of Schistosomiasis during the last few years, and a large number of papers have been published dealing with the results of infestation by these worms. One of the most recent, by Hamilton Fairley, has appeared in the *Journal of Pathology and Bacteriology* for June of the present year.

This interesting communication, a comparative study of Schistosomiasis in monkeys, is concerned with the morbid anatomy and pathological histology of the lesions resulting from experimental infestations studied at varying periods. The mode of deposition of the ova in the venules and the method of their passage into, and through the tissues, are described in detail.

According to Fairley the process of the deposition of ova is briefly as follows: When impregnation has been effected the gravid female worm leaving the larger portal veins migrates to the smaller venules, and forces her way into a vessel of a diameter less than her own. This causes complete blocking of the vessel with consequent cessation of the venous flow. An ovum is then ejected from the genital pore which is at the anterior end of the body of the worm just behind the ventral sucker. The end of the ovum bearing the spine is directed backwards in the direction of the venous current. The female withdraws slightly, leaving the ovum in position, and the venule contracts again to its normal calibre. This process is repeated so that a series of ova is distributed at intervals along the vein causing a line of sacculations in the course of the vessel. The blood current, when the female has finally withdrawn from the venule, tends to resume its normal course, and, impinging on the ova, forces the spines into the vessel wall. The continued pressure of the blood stream enlarges the openings in the venule and forces the ova into the perivenous tissue. Regarding the further process, Fairley makes the following statement: "The spines, hereafter, take no part in

the process of extrusion of the ova to the exterior, which is dependent on the inflammatory softening and cellular accumulation in their vicinity."

It is relative to this latter observation that this note is written.

The accompanying photograph and drawing, of a section of the intestine from a case of *Schistosomum mansoni* infestation, illustrate the point to which I wish to direct attention.

From a study of this section it will be obvious, I think, that the spine of the ovum must play an important part in the process of penetration and extrusion to the exterior. A lateral spined ovum is to be seen lying in the tissues of the intestine and the track left by its passage is clearly evident. The actual stretching and severing of the connective tissue fibres in apposition to its point can definitely be observed; further, there is no marked accumulation of inflammatory cells in its neighbourhood, such as would be present had its movements been brought about by active inflammatory ulceration.

It would appear, therefore, that the migration of the ova through the tissues is largely dependent on a mechanical process in which the spines are an important factor. No doubt transition is facilitated by an inflammatory reaction which causes softening of the tissues in their vicinity, but this is subsidiary to the rending action of the spines on the contiguous tissues. The continuous contraction and expansion of hollow viscera, such as the intestine and bladder, are an important adjuvant to this mechanical penetrative process. Briefly, the movements of the ova in the tissues can be compared to the migration of a sharp foreign body, such as a needle, when situated in muscular tissue undergoing repeated contraction.

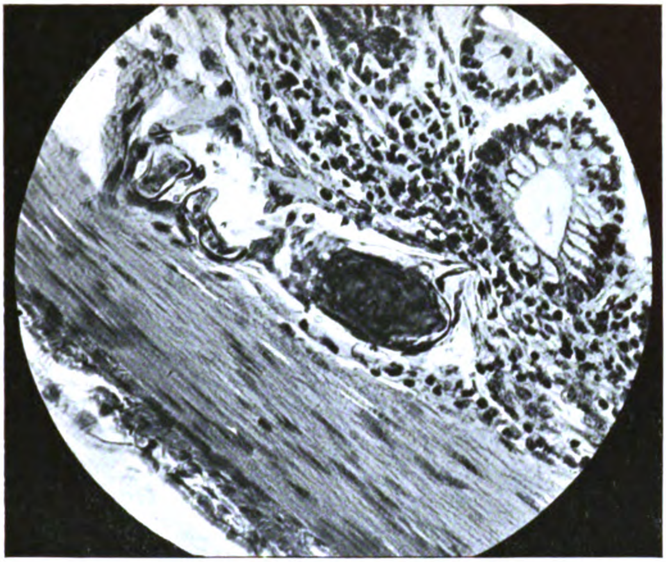

FIG. 1. × 300

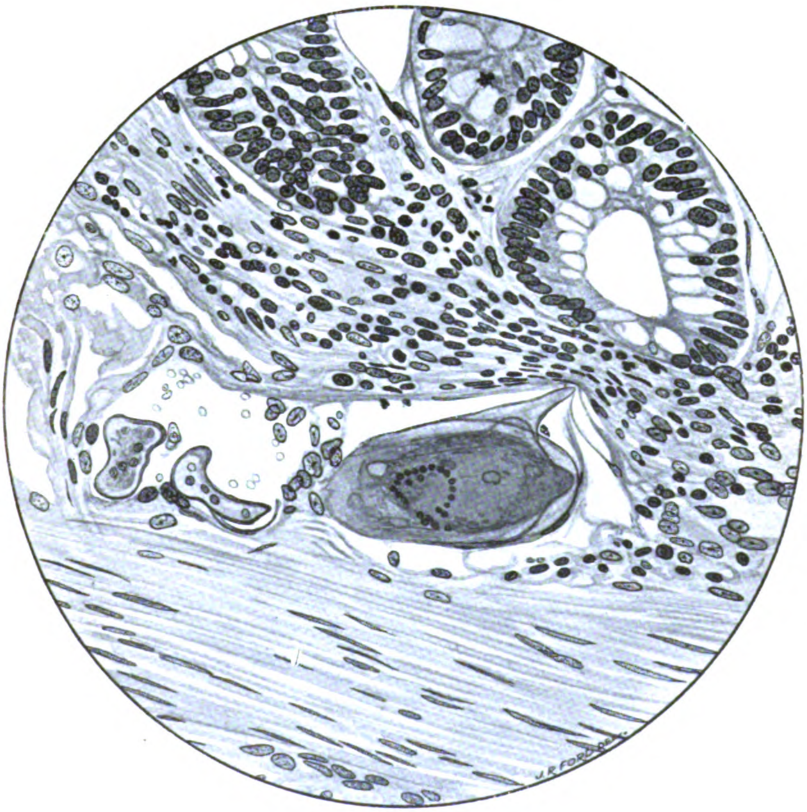

FIG. 2.

To illustrate "The Mechanism of Passage of Ova through the Tissues in Schistosomiasis," by Major H. MARRIAN PERRY, R.A.M.C.

Sport.

AN INTERRUPTED DAY'S FISHING.

By Major W. R. O'FARRELL.
Royal Army Medical Corps.

The long hot day is drawing to a close, and with the setting sun comes that time so looked forward to by those who live in the tropics. Our present home is a little Nile steamer, and now is the hour when the long chairs are usually placed in a semi-circle on the forward part of the deck. With the cool of the evening arrives that first whisky and soda, which seems so well earned, and with it the petty quibbles started by the mid-day heat are forgotten, and man is at peace with his fellows. This evening, however, the long chairs are deserted, and our little company are gathered together on the barge attached to the steamer. To-morrow morning we shall reach the fishing ground on Lake No, and each of us, banishing thoughts of possible disappointment, tries to foresee what luck the coming day may bring.

One can imagine, while we examine our rods and reels, and bring out with evident pride some favourite spoon or spinner, there is but one topic of conversation.

For nearly two months we have been travelling from Khartoum to Gondokoro, from Gondokoro to Dufile and the Fola rapids; on the way back we are attracted to Lake No by tales of fishing.

From the commencement of our journey we have fished assiduously whenever time gave us the chance; nevertheless, up to the present, our efforts have been attended with but little success. However, we are not disheartened; indeed, it would be difficult to dishearten us, for have we not already spent long hours in far-north Khartoum? A blazing tropical sun, a sweating Soudanese bearing crooked beams of wood for oars, a broad-beamed native boat adze-fashioned out of what look like stumps of trees—prehistoric, in keeping with this prehistoric land. Up and down we paddled where the White Nile meets the Blue, a stretch of some quarter of a mile. The native city of Omdurman to the north on the left, Khartoum behind us on the right. With rod and line and strong steel trace and, as a lure, a small silver cass, already have we toiled in the semi-muddied waters of the Blue Nile just at the junction of the two rivers. One has to be an enthusiast to stand the remorseless heat and burthen of empty days. But here lies hope; here it is, in this penumbra of the waters, that the big fish—the silver cass or tiger of the river, and the aigel or cow of the river—have their hunting grounds. Recent trials and failures are forgotten, for to-morrow we reach the fishing Utopia of our dreams.

Morning on Lake No.—The sheet of water lies placid in the light of the rising sun. The rivers expand to form the lake and the edges of the latter are surrounded by sud stretching away in the distance as far as the eye can see. No—one cannot call it beautiful; just a flat sheet of water in a flat country without a tree to break the view. From the deck of our steamer there seems at first sight to be no motion on the surface of the water but, on looking a little more carefully, one can see in the distance a school of hippopotami at play. Little rings disturb the surface of the water and appear irregularly, or in groups. A few minute water spouts in some of the rings and then, but for eccentric ripplings, the water is still. A crop of rings show again at some distance from where the first appeared, and

FIG. 1.—The Steamer (grass fire in distance).

thus one can follow the track of the school at play. Around our steamer we can see little silver streaks darting hither and thither; this bodes well, for here at hand we have our bait. The most enthusiastic amongst us, with a former relic of home days—a trout fly stripped of its hackle on a gut cast and baited with native bread—are already busy over the side catching fish up to a quarter of a pound in weight. But this procedure is rather tedious, and the native Rèyss (Captain) of our steamer is soon out with his cast net. One throw brings in sufficient bait to last us for the day.

Everything is now in readiness, and the steamer's little iron row-boat is alongside, so down we clamber with rod and tackle Some one suggests we should bring a rifle, so a ·45 is gently handed into the boat. A chance

crocodile basking on the bank may enliven matters should fishing be not fraught with success.

Away from the steamer and across the lake, our rods are ready; one a salmon trolling rod with silex reel, the other a short stout sea rod with plain reel. Both reels are mounted with 250 yards of stout salmon line, a steel trace, fine but strong, and an archer-spinner carrying a $\frac{1}{4}$ lb. fish. We have not long to wait. An almighty tug and "WHIRR"! runs a reel, down bends the rod, away goes something in a mad wild rush, and the line cuts through the water like a knife, 100 yards of line in one great effort. All at once the line falls slack and the reel is silent. A moment's anxiety and the question, "has he broken?" No, a few turns of the reel, some

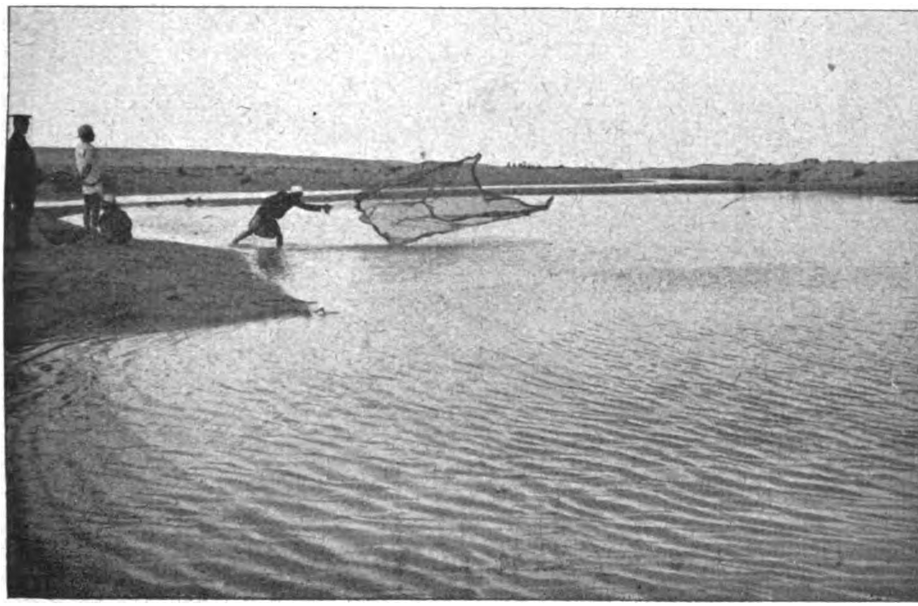

FIG. 2.—The Rèyss casts his net.

little resistance, and away he goes again; one wonders will he ever stop. Suddenly he turns and makes for the boat, the reel buzzing madly to keep pace with the slackening line. Steady a bit; the line goes taut, and with a surge through the water a great mass shakes itself on the surface. The luck, however, is not all with one rod; the second reel soon speaks. This time but thirty yards of line are taken, when right up in the air shoots a long shimmering streak. It is a cass, and one must mind him well, for a cass takes as much to the air as an aigel keeps to the water.

Another dash, and up comes the fish—a gleaming silvery bow, the line falls slack but alas! never to tighten again, for Mr. Cass is free once more in his native element. . . . Kismet.

When we come to examine our bait we find little indeed is left of the

¼ lb. fish. The shark-like teeth of the cass has literally torn it to rags; the great hooks are bent and broken and the spinner's lead centre-bit is scored half way through.

Soon we have three aigel in the boat when the oarsman calls out, "Satel Bey, Goriniti Gerib"—"Sir, hippopotami are near." Our attention is now temporarily diverted from the fishing as we watch a few rings breaking the surface of the water some quarter of a mile away, and we sit quietly engrossed by the movements of our neighbours.

But contentment consequent on the success of our fishing, and our lazy interest in the habits of the Nile fauna are soon to be disturbed, for we notice one ring detached from the remainder about 250 yards from our boat. This is altogether too near to be pleasant.

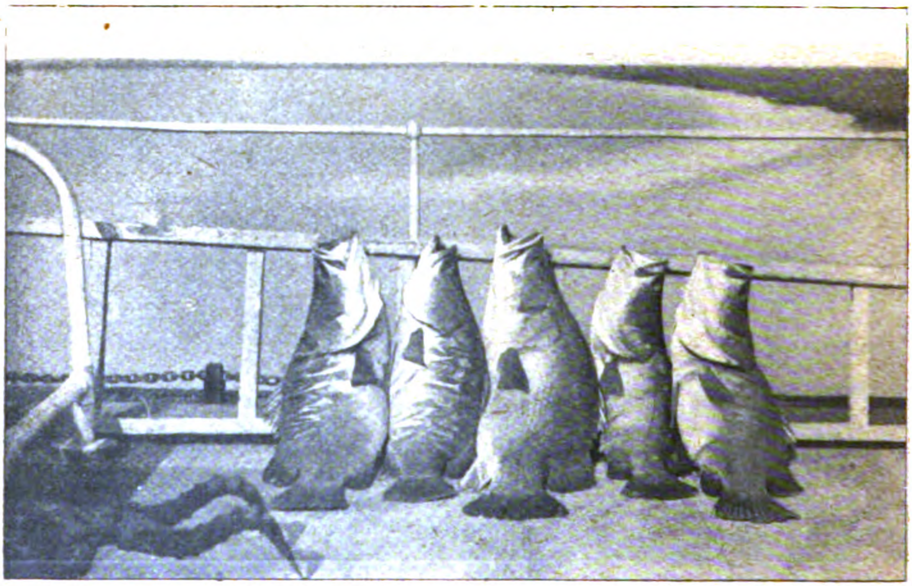

Fig. 3.—The day's catch.

We quickly take stock of our situation, and find that we are now on the opposite side of the lake from the steamer and about 250 yards from the shore. Perhaps it would be wise to get in a little nearer. The necessary order is given to our oarsman, but hardly has the boat been turned when up comes a ring 200 yards from our stern. All thoughts of fishing are now abandoned and the rifle is passed to the stern, where anxious hands quickly load and hold it lightly ready, pointed in the direction of the approaching menace. Our unwelcome visitor must be some old bull, or cow with young, which has detached itself from the school and may be following us under the promptings of curiosity or anger, we wonder which. One fact is soon borne in upon us namely, that we are being followed

for, at 100 yards from the bank, the ring is 85 yards away and, at 50, but 50 yards behind us.

The time has now come to make up our minds about shooting. We are fully aware that a shot from a moving boat at a hippopotamus in the water, even at close range, is almost certain to have no killing effect, though it may have a stopping one; on the other hand a wounded hippo is a very dangerous antagonist. Another factor to be taken into consideration is that we are quite near the bank, and this spells safety for us. Soon we reach it, with our pursuer but twenty-five yards in our wake. Imagine our consternation when we find one point overlooked: our bank is not solid but sud! a mass of weeds perhaps six inches thick. We are still virtually on the water. Moreover, with the last disappearance of our enemy the chance of a shot has gone for ever, and powerless we await our fate, every moment expecting to be overtaken by we know not what disaster. Curiously enough our anxiety in this crisis, instead of turning to thoughts of personal safety, is engrossed by the possible sad loss of the morning's catch. There is but one element left to us and that is luck. Our boat is now parallel with the bank, and perhaps some few oar strokes at right angles to her original direction; we cannot claim this as premeditated but merely an accident, the result of custom. This saves us, for at this moment from behind our stern there is an upheaval in the water, the momentary vision of a great yellow back and a tearing of breaking weeds as our pursuer rips his way through the sud and under it, out of sight.

We now pull quickly round the margin of the lake, and though not actually followed, mentally we are still pursued till we reach the safety of our steamer. Fishing for the morning is now at an end. In the afternoon the steamer is moved over to a fishing ground that appears good, and though we do not go far, our bag at the end of the day totals five aigel, each from nineteen to forty-four pounds in weight.

As a single aigel may weigh as much as 300 pounds our catch may be considered small, but we are quite well satisfied. Unfortunately we have to proceed northward the following morning.

We vow, however, to return some other day. This seems hardly probable now, but, despite the hippos, I would risk my luck again to-morrow were I given the chance.

Current Literature.[1]

Diphtheria: (1) Antitoxin Treatment.—Armand-Delille considers that, while antitoxin given intramuscularly is quickly absorbed and quickly operative, it is at the same time, when given in this way, quickly eliminated. The author thinks that the absorption and elimination of antitoxin is much slower when the serum is given subcutaneously, and in order to ensure continuous action he combines both methods. Thus for children up to ten years of age he gives thirty to forty cubic centimetres by subcutaneous injection on admission, and forty to sixty cubic centimetres by subcutaneous injection on the following day.—*Practitioner*, May, 1920, p. 396.

(2) Cats and Human Diphtheria.—Dr. W. G. Savage, C.M.O.H. for Somerset, has been at some pains to determine for himself whether there are any grounds for the "belief amongst medical men, particularly those who are medical officers of health, that cats may suffer from diphtheria, and convey it to human cases, and that they are a not uncommon source of infection." Dr. Savage presents an account of his investigations to the *Journal of Hygiene* for February, 1920, pp. 448-462, and arranges his article as follows:—

(1) Account of available evidence upon which the association of cats with diphtheria has been built.

(2) Summary of his own investigations.

(3) Critical considerations of the whole of the data available.

The evidence reviewed in the first section is both experimental and epidemiological.

I. Historical Evidence: (A) Experimental.—The work of Klein in 1888, 1889, and 1890, is chiefly discussed as being "the most considerable in volume and of most importance as regards its influence upon contemporary and later medical opinion."

As a result of inoculating cats and kittens subcutaneously and intravenously with pure cultures of diphtheria bacilli, death followed in the majority of cases, and the post-mortem changes were considered by Klein "as extremely characteristic of diphtheria disease in the cat." These changes were chiefly noticed in the kidneys, and were as follows:—

Enlargement of the whole organ; almost entire cortex grey and in a condition of fatty degeneration; medulla by contrast much congested; swelling of uriniferous tubules; extensive fatty degeneration of epithelium.

As regards feeding experiments, one kitten and two cats fed by Klein with agar cultures in milk remained well, but two other cats which were fed in the same way on three separate occasions became very thin, though showing no other symptoms, and were killed three or four weeks after the beginning of the experiment. Klein considered that these animals showed post-mortem changes similar to those that obtained in the case of the inoculated cats, and wrote: "From these experiments it is seen that by *repeated* feeding with cultures of diphtheria bacilli, distributed in milk, unquestionable diphtheria disease can be produced in the cat." But, as Dr. Savage remarks here, "not the slightest bacteriological proof is given or evidence supplied of the presence of any clinical or pathological features of diphtheria."

From post-mortem appearances, especially in the kidney, Klein also diagnosed cat diphtheria in animals, which he considered were accidentally infected from human cases.

[1] Abstracts of the literature by Lieutenant-Colonel S. P. James of the Ministry of Health.

Renshaw (1885), in 1874, administered diphtheria membrane from human cases to a number of cats, most of which became ill and died and were found with diphtheric membrane on the fauces, bronchial tubes, etc.

Welch and Abbott (1891) inoculated into the trachea of a half-grown kitten a platinum loopful of pure diphtheria culture. The animal died on the third day, and diphtheria bacilli were found in the membrane which had appeared in the trachea and larynx. No other remarkable lesion was found "unless it be a greater degree of fatty metamorphosis of the renal epithelium than is normal in kittens."

(B) Epidemiological Evidence.—The author gives particulars of a number of cases which may be condensed as follows:—

Turner (1886), apparently the first observer to report the association of illness amongst cats with cases of human diphtheria.

Evidence entirely circumstantial, consisting of the concurrent presence of human cases with cats ill with swelling of the neck, foul discharge from the nose, eye inflammation, etc.

Bruce Low (1888) reported similar relationship at Enfield.

Williams, (1895). In a house harbouring a human diphtheria case, three cats taken ill with wasting, loss of appetite, inability to swallow. All died. In one, Klein reported extensive disease of the lung not uncommon among cats.

Gwynn (1893) at Hampstead. Here the cat's throat symptoms were due to an unhealed abscess.

Dowson (1895) examined a cat from a house in which fourteen days previously a child had died of diphtheria. Cultures from lung yielded pure cultures of an organism morphologically resembling the diphtheria bacillus.

Symes (1896). Kitten in close contact with a fatal case of diphtheria was subsequently attacked with vomiting and diarrhœa, slight swelling of neck and with patches of yellow exudation on the fauces. These patches extended, and the cat finally died, but was buried without a post-mortem.

Barras (1905). Illness in cats attached to two houses in Govan, where diphtheria had occurred. Micro-organisms isolated from the throat of these cats were found to correspond in every respect to those of the human diphtheria bacillus. No details of symptoms, and no account of the bacteriological technique is given. A stray cat which had found a home with one of the affected families was found to be suffering from post-diphtheritic paralysis of hind legs.

Porter (1903) obtained organism from the fur of a cat living in a house where there were several cases of diphtheria, and these bacilli were identical in appearance (Methylene Blue and Neisser's) with the Klebs-Löffler bacillus.

Mapleton (1913). During an outbreak of diphtheria at the Cottage Home, Newton Abbot, three cats were bacteriologically examined and two were found infected. The bacilli were not isolated in pure culture, and no inoculations into animals were made. The cats were not ill.

Webb (1914) reported an outbreak of illness among cats at Leigh (Lancs) which seemed associated with a case of diphtheria in a child. The cat belonging to the house which contained the human case of diphtheria had been ailing for over two weeks, had a peculiar cough, could not miaw properly, refused food, was very thin, and could hardly move. During the previous week, two cats presenting similar symptoms had died in neighbouring houses. The throat of the first cat was in a dirty and sloughing condition and cultivations showed "a bacillus having the characteristics of the K.-L. bacillus." Organism not isolated in pure culture, and no cultural or inoculation tests.

Five other cats in same street were found to be ailing and were destroyed.

Priestly (1915) examined nine cats belonging to the Stockwell Orphanage at a time when diphtheria was prevalent in the institution. None of the cats were

clinically ill, but four "carried the diphtheria bacillus." The bacilli were said to be morphologically and culturally undistinguishable from the true K.-L. bacillus, but no inoculation experiments were carried out, and apparently the bacilli were not isolated in pure culture.

II. The Author's Investigations: (A) Bacteriological examination of the throat and nose of healthy cats not associated with any cases of human diphtheria.—Eight cats and twelve kittens were the subjects of this inquiry. The method of examining consisted in taking 1 or more swabs in the ordinary way, and then charging at least 3 blood serum tubes and 1 agar tube in series without recharging. The usual order was 1 serum, 1 agar, 1 serum, 1 serum tube, the object being to obtain considerable dilution of bacteria in the last 2 tubes, so that discrete colonies could be obtained.

Result.—(1) All the twelve kittens failed to show any bacilli at all resembling diphtheria organisms. (2) Swabs from three of the cats showed no bacilli at all resembling the K.-L. bacillus.

From the remaining five cats (*i.e.*, in 66 per cent) bacilli were isolated which to the author and the county pathologist presented no morphological differences from true diphtheria bacilli. "All of them, however (with possibly one exception), were definitely not true diphtheria bacilli."

The possible exception was a cat from a girls' school, which was twice examined, and in which on both occasions the bacillus isolated was "extremely like the true diphtheria bacillus both morphologically and culturally." The blood serum colonies, however, had a distinct yellow tinge, and the bacillus was non-pathogenic to guinea-pigs.

(B) Examination of cats associated with human cases. The number of such cats examined was five.

Result.—(1) A favourite cat, much in the room with a severe case of diphtheria, and with two children who had severe colds but were diphtheria negative.

The cat presented no symptoms. Primary films showed bacilli undistinguishable from K.-L. bacilli, but in pure culture these bacilli were far less like the true diphtheria bacillus.

(2) Cat living in close association with a woman suffering from diphtheria. Cat had no general symptoms; throat swab showed a few bacteria suspiciously like diphtheria organisms.

(3) Cat associated with case of diphtheria. Animal remained quite well, and throat showed no bacilli like the K.-L. bacillus.

(4) Boy of eight developed diphtheria on November 22, 1916. The cat, which was continually fondled and nursed by the boy, had been "off its food" for a week previous to the boy's illness, and then showed difficulty in swallowing.

Cat swabbed December 6: "Bacilli impossible to exclude as not K.-L. bacilli." They were only present in small numbers and on a second swabbing later no such bacilli were found.

Cat killed, and post-mortem showed no changes even in the kidneys. Swabs from throat and trachea negative.

(5) For three to four weeks previous to the removal to hospital, of a bacteriological case of human diphtheria, the house cat was ill, refusing to eat, and being the subject of a discharge from nostrils and mouth. The cat had quite recovered by the time the case was sent to hospital, and six days after this event she was swabbed and then killed. There were no macroscopical changes seen at the post-mortem.

Films made from blood serum cultures showed bacilli, which morphologically and culturally were K.-L. bacilli, but they were innocuous to guinea-pigs. The author thinks that in this case the bacillus "may possibly have been a non-pathogenic Klebs-Löffler bacillus."

(C) Experimental Investigations with Kittens.—Arguing that "if cats suffering from diphtheria act as carriers of the diphtheria bacillus it should be possible to infect them artificially and set up either condition," the author experiments with several kittens in which previous throat swabs had in every case proved negative.

Results.—(1) It was found impossible to infect them by throat swabbing, even with massive doses of various strains of bacilli recently isolated from acute human cases.

(2) Mixed cultures direct from human throats were innocuous even when an artificial nidus for local growth was provided by chemical or mechanical means (iodine and scarification.)

(3) Implantation of vast numbers of bacilli in nasal cavities equally ineffective.

(4) Feeding experiments equally unsuccessful; the kittens grew fat on vast numbers of the virulent bacilli.

(5) Strains which were incapable of infecting by means of throat swabbing proved highly pathogenic when injected subcutaneously. In one kitten so treated, and which died on the ninth day, all the pathological changes were confined to the kidneys and suprarenals. The kidneys were enlarged and in section showed marked cloudy swelling of the cells of the cortex and medulla with enlargement of all the blood-vessels. The suprarenals (not mentioned by Klein) showed a condition of acute inflammation with dilated engorged blood-vessels, and swollen, turbid, indistinct cells in both cortex and medulla.

III.—Critical Consideration of Available Facts. (A) Is there a Cat Diphtheria?—(*a*) The author allows that the work of Klein and others, including himself, conclusively proves that cats are not immune to the toxins of diphtheria when these are directly injected beneath the skin or into the trachea. Also lesions are found post mortem similar to those seen in inoculated guinea-pigs. This, however, does not mean that cats suffer from diphtheria naturally any more than do guinea-pigs. (*b*) "The evidence brought forward from the association of human diphtheria cases with case of illness among cats whose throats are said to show diphtheria bacilli, must be regarded as valueless in almost every case: because"—

(1) In all the recorded cases, the diagnosis rests entirely upon a purely morphological similarity between the isolated bacillus and the true Klebs-Löffler bacillus.

In the author's experiments also it was shown that, in no less than 66 per cent of normal cats, bacilli were isolated which closely resembled true diphtheria bacilli, and the differentiation of which was impossible without isolation and study in pure culture.

(2) The fact that cats may be ill is no real evidence for suggesting that the human and cat conditions are related.

The author quotes two authors who have described cats' illnesses, thus:—

Gray (1896): "The so called diphtheria in the cat is a contagious disease of the cat, characterized by the presence of diphtheritic membranes on the fauces, pharynx, or larynx, and due to some micro-organism not yet determined. The disease has a mortality of quite 90 per cent."

Gofton (1913): "The kidney condition described by Klein as pathognomonic is an exceedingly common condition of the cat's kidney. Affections presenting diphtheritic characters are met with in the cat and occur independently of human diphtheria, but the bacteriological investigations of these infections has up to the present always resulted in failure to demonstrate the presence of the human bacillus."

(B) Are Cats carriers of Diphtheria?—The author contends that far from cats being able to act as carriers, it would appear from his experiments that the mucous membrane of these animals is particularly inimical to these bacilli.

Dr. Savage sums up his paper as follows: "I am of opinion that the common and widely accepted view that cats can suffer from a naturally acquired disease caused by the diphtheria bacillus is entirely without foundation.

Tonsillectomy as a "Cure" for Diphtheria Carriers.—In the *Medical Journal of Australia*, Drs. Graham Brown and Kent Hughes give an account of their work and opinions regarding this subject.

The authors point out that during 1919 throat swabbing became a general practice in the schools of Brisbane and one that yielded a surprisingly high percentage of carriers. At a school in Windsor, for example, there were 97 children out of 800 scholars who gave a positive result = 12.12 per cent.

The problem, however, with which the authors mainly deal is that relating to the convalescent child in a diphtheria block and the present unsatisfactory attempts to cure, in a reasonably short time, this type of carrier.

The health regulations in force at Brisbane require that three negative examinations conducted at 48 hours intervals shall have been made before a patient is pronounced free from infectiousness. In order to comply with this test patients were known to have stayed in hospital for as long a period as 190 days.

"We have before us the names of 22 patients who, during the last three years 1916-19, remained in the hospital for periods varying from 87 to 190 days. One of these patients was in for 152 days suffering from diphtheria of the pharynx, nose, ear and an amputation wound."

During 1919 over 100 tonsillectomies were performed upon persistent carriers in hospital and these gave an average of ten days after operation, until the three consecutive negative "swabbings" were obtained.

In all the cases the tonsils were removed, under ethyl chloride anæsthesia, by the "Sluder" method. Carriers took, on the average, 14·8 days to clear.

In conclusion the authors emphasize the following points:—

(1) Carriers of diphtheria bacilli (and morphologically similar bacilli) are far too prevalent.

(2) Bacilli can frequently be found in the deepest parts of the tonsils.

(3) The explanation of the disappointing results from antiseptic swabbings and spraying can be found in the above mentioned fact.

(4) No case of faucial diphtheria was noticed among children who had previously been subjected to thorough tonsillectomy and adenoidectomy.

(5) "The results obtained in our series of cases are sufficient to warrant the procedure of the enucleation of the tonsils and the thorough removal of the adenoids as a routine in all cases of persistent carriers of the diphtheria bacilli."

Diphtheria of Wounds.—In the January 1920 number of *Medical Science*, pp. 404-409, Mr. W. G. Spencer has gathered up some of the clinical notes relating to diphtheria of wounds.

In France, cases were first noticed among the Canadian troops and the fact that, among returning soldiers to Canada, a large proportion of cases in a selected series of unhealed wounds presented diphtheria-like bacilli gave rise to a special inquiry.

Out of 306 cases examined by Professor Adami, however, only four were found to be associated with true diphtheria bacilli and in two of these cases the bacilli were virulent.

In Magdeburg during the war faucial diphtheria was prevalent in the military and civil hospitals and a large number of wound infections occurred. It did not necessarily happen that the patient had diphtheria bacilli in the fauces, nor that a subject of wounds who suffered from faucial diphtheria would necessarily develop wound diphtheria.

"Schmidt found that diphtheria of a wound was not accompanied by such an obvious disturbance as in diphtheria of the fauces. The most dangerous complication was the effect on the heart."

Walshe thinks that cutaneous (wound) diphtheria may be followed by a purely local paresis which is determined by the site of the wound.

In addition to the gross wounds of warfare it was found in Germany that the subjects of pediculosis and scabies not infrequently contracted cutaneous diphtheria, the virus being injected during the habit of scratching.

Finally, the desert sores, so prevalent among the Australian cavalry operating "east of Suez," were thought by Colonel Martin to be associated with diphtheria bacilli, but in only one case were true K.-L. bacilli isolated.

Crowe in Egypt found that diphtheria antitoxin was an "absolute specific" for the septic boils and sores among the troops of the Egyptian Expeditionary Force.

Reviews.

THE ASSESSMENT OF PHYSICAL FITNESS. By G. Dreyer, C.B.E., M.D., and G. F. Hanson. London: Cassell and Co., Ltd., 1920.

A satisfactory method for the assessment of physical fitness has long been a desideratum, a method which is simple, requires the use of no complicated apparatus and is both reliable and rapid in application. The method proposed in this book would seem to fulfil all the conditions. It is based on the relationship between the body weight, the sitting height, the circumference of the chest and the vital capacity of the lungs. The main part of the book is devoted to statistical tables dealing with the normal standards which were determined practically. These tables obviate the necessity of long and cumbrous calculations. Full details are given of the methods of making the various measurements, the difficulties met with and the deductions to be drawn from the figures obtained. Attention is particularly drawn to the significance of deviation from the normal figures. It is maintained, for instance, that if an individual has 10 per cent less vital capacity than is normal for his class (there are three classes of people representing perfect, medium and poor physical fitness) "it is *probable* that he is suffering from some health depressing condition, and if he is as much as 15 per cent below the normal limit it is *practically certain* that he is abnormal in this respect."

"ORTHOPÆDICS FOR PRACTITIONERS:" AN INTRODUCTION TO THE PRACTICAL TREATMENT OF THE COMMONER DEFORMITIES. By Paul Bernard Roth. London: Edward Arnold. Pp. 195.

This is a most useful little book and will be welcomed by practitioners for whom it is designed. Most works on orthopædics are so large and have such a wealth of detail that the average practitioner has not the time to digest them or to decide as to what is the best of the many methods described.

This little book gives a short account and clear lines for treatment which in the hands of the author have given good results. While not overlooking operative treatment in certain cases, the author strongly insists that the majority of cases of deformity, if seen early and intelligently treated, can be cured without a cutting operation.

We are not in agreement with the author when he recommends splitting the patella to remove a dislocated semilunar cartilage; whereas this is ideal and necessary in dealing with damage to the crucial ligaments, it is only very rarely that it would be required in the removal of a semilunar cartilage.

The chapter on injuries to peripheral nerves is good in short compass, but is only a very brief outline and no mention is made of that interesting and difficult condition, causalgia.

It is to be regretted that the author could not have devoted more space to the subject of amputation stumps and artificial limbs, a problem that every practitioner is now brought into almost daily contact with and where clear advice would be so valuable.

The short account is, however, full of sound advice but is far from exhaustive.

The chapter on the treatment of old gunshot injuries is also too short to be of value for reference.

With regard to the treatment of cavities in bone we would point out that the important point in the operation, besides removing enough bone and turning the cavity into as nearly a plane surface as possible, is to do a sub-periosteal operation, and then as soon as the bone surface has covered over with granulations the periosteum and the soft tissues should be approximated to the floor of the cavity, when healing and obliteration of the bone cavity will be much hastened.

With regard to the section on stiff joints following gunshot wounds, we note that no mention is made of the commonest cause of limitation of the movements of a joint, namely, adhesions of muscle and fascia.

The last chapter gives a short but clear account of the various types of Thomas's splints.

The book is well produced and well illustrated, and we note only a single misprint, the heading to p. 92.

THE JOURNAL OF NEUROLOGY AND PSYCHOPATHOLOGY. Bristol: John Wright and Sons, Ltd. Published quarterly. Subscription 30s. per annum.

The first volume of "Neurology and Psychopathology" is launched under the ægis of a committee of no less than six editors, whose names are well known in their special branch of medicine for which the journal is responsible. The journal has a special merit in that it links up neurology with psychiatry. This in itself is a good beginning, for the separation of the two for so long has been a mistake.

Amongst several original papers is one by Dr. W. McDougall on "Suggestion." The writer devotes much space to the definition of the word itself, and after comparing his definition with that of several other writers on the subject, concludes with what he considers to be the most convincing. But surely something shorter and simpler would meet the purpose. We would suggest the following: "The entrance into the mind of an idea originated by some external word or action, and which tends to produce an automatic response."

Dr. Parkes Weber contributes an interesting article on "Some Thoughts on Thinking and Dreaming," and criticizes the exaggerated significance attached by Freud to the sexual element in dreams. He draws the not unusual distinction between physiological and pathological dreams. But is not all dreaming pathological?

Normal sleep is a complete physiological or healthy dementia when the functions of the higher nerve centres are obliterated, and it is caused by a withdrawal of the blood supply to the brain. Dreaming results from partial circulation to the various centres, with the result that the dissociated islets of the cortex are in a state of comparative activity. Dreams are simply hallucinations occurring during sleep, and should not take place in perfectly natural sleep. In those who have occasional dreams there is possibly some toxic agent at work. We are all of us familiar with the dreams of those suffering from the various psychoses, and much wild work may go on in the brain which is morbidly excitable. Neurotic and highly strung people dream regularly, and nervous morbid men of genius such as Byron, Shelley, Southey, and Coleridge, have put it on record that they were fantastic dreamers. There is surely a pathological element in all dreams.

A considerable section of the journal is devoted to abstracts from current literature on neurology and neuropathology, which should be of great value to workers in these special branches.

The journal is well produced by the publishers, and if future numbers maintain the high standard of this one, the journal is certain of a wide circulation among medical men. N. H. O.

A SYNOPSIS OF MEDICINE. By H. Letheby Tidy, M.A., M.D., B.Ch., F.R.C.P. Bristol: J. Wright and Sons. Pp. 968. Price 25s. net.

To attempt to present the principles of medicine in a synoptic form, and at the same time insert such details as are necessary to make a book useful for reference and preserve its compact and handy form is a task that one might well shrink from, but the author of "A Synopsis of Medicine" has accomplished this most successfully. The aim of the author may best be expressed in his own words: "It is hoped that the book may be of assistance to those who have to revise rapidly their knowledge of medicine in general or of some disease in particular; to the worried student whose final examinations are in sight, and to the hurried practitioner from whose ken they have long passed, possibly even to the teacher with a lecture to prepare and to the examiner who, for the purposes of a "viva voce," desires to renew for a brief period his knowledge of any of the essential details of medicine."

In the first four sections diseases are arranged in groups according to their etiology and the remainder of the thirteen sections deal with diseases according to systems. Each disease is dealt with under the headings of Etiology, Pathology, Symptoms, Diagnosis and Treatment, in a concise but thorough manner. The system of tabulating, in different types, the points to be noted under the various headings is attractive and is of great assistance to one desiring rapidly to revise or to refresh his memory.

This book may well be commended to the attention of medical officers sitting for examinations. J. C. K.

HANDBOOK OF DISEASES OF THE NOSE, THROAT AND EAR, FOR STUDENTS AND PRACTITIONERS. By W. S. Syme, M.D., F.R.F.P. and S.Glas., F.R.S.E. Edinburgh: E. S. Livingstone, 1920. Pp. viii, 329. Price 9s.

This is an excellent little book and supplies a long-felt want for the senior student of medicine who wishes to gain some knowledge of these subjects without wading through more pretentious works.

In spite of its brevity the subject is presented in such a way as to stimulate the desire to follow up the subjects touched upon.

The chapter on the removal of the tonsil is very good, and the vestibular tests are simply and accurately described. Other sections worthy of special mention are those upon chronic dry catarrh and otosclerosis. The diagrams are only fair, and fig. 16, which is marked "Aneurism of the Arch of the Aorta," is very poor and might well be omitted.

In dealing with retro-pharyngeal abscess, it is to be regretted that the suspension apparatus, which is mentioned, is not more fully described.

On p. 221, "Sometimes the auricles are normally abnormally large" sounds curious.

An explanation of the fistula reaction in connexion with middle ear suppuration would be an improvement.

The book is well produced, clearly printed and free from typographical errors. It can be strongly recommended to students and practitioners as an introduction to the subject.

Correspondence.

THE SOLDIER'S TOOTH-BRUSH AND SHAVING-BRUSH.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—The subject of the soldier's welfare has occupied so many minds with success, as regards feeding, housing, clothing and equipment, that it is surprising how the comparatively trifling items of the shaving-brush and the tooth-brush have so far not attracted the attention they deserve.

The prevalence of dental disease in peace and war and the occasional small outbreaks of eczema and impetigo about the face and neck, have always appeared to me a strong reason why the tooth-brush and shaving-brush should be issued each in a proper case. The present very loose system of the hold-all is certainly most unsatisfactory—from the point of view of personal cleanliness—for obvious reasons, which I need not labour. Further the average individual seldom understands the importance of the subject sufficiently to provide himself with these necessaries at his own expense.

Hoping that my letter may give the stimulus in the proper quarter.

I am, etc.,

J. E. GATT,

Major, R.A.M.C.

Curragh,

September 24, 1920.

TACTICAL HANDLING OF FIELD AMBULANCES.

TO THE EDITOR OF THE "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS."

SIR,—With reference to the interesting article by Major Reed in this month's Journal on "Tactical Handling of Field Ambulances in Mobile Warfare," the following methods (as employed in a division in France) of handling ambulances during the advance in 1918 may be of interest. At the commencement of the offensive, the ambulances of the division were allotted to the brigades, and remained as brigade units (as did also the train companies and field companies R.E.) till the termination of hostilities. It can be assumed that the brigade is the unit of attack. One ambulance (X) is detailed for "clearing the line," the bearer divisions of the remaining two ambulances (Y) and (Z) are attached to it.

A selected bearer officer and the bearer division and a motor cyclist of his ambulance (X) are attached to brigade headquarters, and are on the strength of brigade headquarters, for rations, billets, march orders, etc. Of this personnel, immediately before the attack, two squads, one N.C.O. and one runner, are attached to each battalion. (This absorbs the brigade headquarters bearers.)

Officer commanding ambulance gets early and detailed information from his brigadier *re* the attack, and he informs the brigadier of distribution of bearers, and where wounded are to be brought, i.e., wounded collecting post (usually a point close to the brigade headquarters).

From this point Ford cars can in most instances be used for conveyance of

"lying cases" to divisional dressing station formed by ambulance (Y) (attached to brigade in support) and staffed by the tent divisions of ambulances (X) and (Y) or (Y) and (Z).

The bearers of ambulances (Y) and (Z) in rotation relieve the bearers in the line as required (e.g., after forty-eight hours). In addition, prisoners are made full use of to carry casualties from the line to divisional dressing stations and for loading at the wounded collecting posts.

Ambulance (Z) remains "closed up," and sooner or later has to take its turn in forming the "Corps Main Dressing Station," when it becomes a corps unit.

All the brigade ambulance cars (ten) from (X) and (Z), and its own Fords are attached to ambulance (Y). The Fords of (X) and (Z), i.e., four, are at the disposal of officer commanding (X) for clearing from wounded collecting posts to divisional dressing station.

For this purpose the horsed ambulance wagons are useless (*a*) on account of time taken to make journeys; (*b*) the horses get "done up" and are unable to march when their unit moves on; (*c*) a Ford car with half the load can make six journeys to one of a horse ambulance wagon.

RÉSUMÉ.

(1) During operations ambulances are brigade units in the same way as are the train companies and field companies R.E.

(2) The entire arrangements for "clearing the line" are in the hands of the officer commanding ambulance attached to the attacking brigade. All the divisional bearers and any additional bearers from non-medical units are under his orders.

(3) Operation orders are received in detail earlier through the brigade, and the medical dispositions arranged on the spot with the brigadier, and inserted in brigade operation orders.

(4) The officers commanding ambulance should keep the Assistant Director Medical Service informed (by motor cyclists at brigade headquarters) of changes in front line, number of casualties, etc., and when necessary request the moving up of divisional dressing station; at the same time suggesting the place at which it should re-open.

The foregoing are entirely personal opinions from an ambulance commander's point of view, and are in no way to be taken as hard-and-fast rules. They are possibly only applicable to conditions that were present in France, and might be undesirable under different conditions and in other theatres of war.

I am, etc.,
W. I. THOMPSON,
Major, R.A.M.C.

INDEX TO VOLUME XXXV.

C.N. = Clinical and other Notes.
C.L. = Current Literature.

JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

JULY, 1920.

EXTRACTS FROM THE "LONDON GAZETTE."

War Office,
June 11, 1920.

FRANCE.

The names of the undermentioned officers are to be added to those brought to notice for distinguished and gallant services and devotion to duty by Field-Marshal Sir Douglas Haig, K.T., G.C.B., O.M., G.C.V.O., K.C.I.E., late Commander-in-Chief of the British Armies in France, in his dispatch of March 16, 1919. (Published in the Supplements of the *London Gazette*, dated July 5, 7, 8, 9, 10 and 11, 1919, Nos. 31435, 31437, 31439, 31442, 31446, and 31448 respectively):—

Temp. Lieut.-Col. C. S. Myers, C.B.E., M.D., Royal Army Medical Corps.
Capt. C. S. O'Neill, O.B.E., M.D., Royal Army Medical Corps.
Capt. R. W. A. Salmon, O.B.E., M.D., Royal Army Medical Corps (Territorial Force).
Temp. Hon. Major Sir A. C. Valadier, K.B.E., C.M.G., Special List.

EAST AFRICA.

The name of the undermentioned officer is to be added to those brought to notice for valuable and distinguished services by Lieut.-Gen. Sir J. L. Van Deventer, K.C.B., C.M.G., Commanding-in-Chief, East African Force, in his despatch of September 30, 1918. (Published in the Supplement of the *London Gazette*, dated January 31, 1919, No. 31156):—

Temp. Capt. W. G. Cobb, D.S.O., M.B., Royal Army Medical Corps, attached K.A.R.

The names of the undermentioned officers are to be added to those brought to notice for valuable and distinguished services by Lieut.-Gen. Sir J. L. Van Deventer, K.C.B., C.M.G., Commanding-in-Chief, East African Force, in his dispatch of January 20, 1919. (Published in the Supplement of the *London Gazette*, dated June 5, 1919, No. 31387):—

Capt. (Acting Major) S. J. V. Furlong, C.B.E., M.B., Royal Army Medical Corps (Special Reserve).
Capt. (Acting Lieut.-Col.) J. D. Kidd, O.B.E., M.C., M.B., Royal Army Medical Corps.
Temp. Capt. (Acting Major) F. R. Brown, O.B.E., M.B., Royal Army Medical Corps.
Qmr. and Capt. J. W. Corking, O.B.E., Royal Army Medical Corps (Territorial Force).
Capt. (Acting Major) B. L. Davis, O.B.E., Royal Army Medical Corps (Territorial Force).

AMENDMENTS TO MENTIONS IN DISPATCHES.

The undermentioned are now correctly described:—

France.

London Gazette, dated February 17, 1915 (No. 29072). Temp. Lieut. E. W. Carrington, M.B., Royal Army Medical Corps.

London Gazette, dated May 25, 1918 (No. 30704). Qmr. and Hon. Capt. E. H. Senior, 55th Field Ambulance, Royal Army Medical Corps.

Italy.

London Gazette, dated May 30, 1918 (No. 30711). Temp. Capt. S. J. Darke, M.C., M.B., Royal Army Medical Corps.

Kurdistan.

London Gazette, dated February 12, 1920 (No. 31777). On page 1803, in the heading and line 4 of the preamble for "Central Kurdistan" substitute "Southern Kurdistan" and further on page 1804, in the heading and line 4 of the preamble for "Southern Kurdistan" substitute "Central Kurdistan."

Mesopotamia.

London Gazette, dated February 21, 1919 (No. 31195). Temp. Capt. T. C. Cregan, Special List, attached Royal Army Medical Corps.

North Russia.

127785 Cpl. J. Geoghegan, Royal Army Medical Corps.

Salonika.

London Gazette, dated July 21, 1917 (No. 30196). Capt. T. Carnwath, Royal Army Medical Corps (Territorial Force).

London Gazette, dated January 12, 1920 (No. 31728). Temp. Capt. G. Hardwicke, Roya Army Medical Corps, attached 3rd (H.C.) Field Ambulance, Royal Army Medical Corps (Territorial Force).

NOTES FROM NETLEY (No. 4 Company, Royal Army Medical Corps, Netley) :—

Corps Examinations.—These were held on May 18 and succeeding days. In addition to being full of interest to the candidates as milestones in their military career, they made a splendid reunion for many old friends.

Sports.—The Garrison Sports are fixed for July 8, when a very full and varied programme will be carried out. During the week July 5 to 10, the Royal Army Medical Corps Band will visit Netley, and the 8th will prove a good day for a visit to this well-known beauty spot.

Golf.—Golf has put up a gallant fight during the month against cricket and lawn tennis—to say nothing of nautical attractions—but it has at last seemingly been overwhelmed.

A second "Foursome Tournament" took place at Stoneham on the same lines as the one we mentioned last month, the lowest handicap being parterned by the highest, the second lowest with the second highest, and so on. But whereas in the first tournament the final was fought out between the four outside handicap men, the four middle men met in the final of the second, which goes to show what an excellent form of competition this is. Col. Turner 8, and Capt. McClelland 12, defeated Capt. Rowley 10 and Capt. McGrath 12.

Cricket.—The season has not started auspiciously. Of five games played, three have been lost and only one won, but there is good material, and when the best side is mobilized we shall be formidable enough. At present the two best bowlers are *hors de combat.*

On the 9th, No. 6 Company, Royal Army Medical Corps, Cosham, visited Netley. The day was fine, and the visiting team were accompanied by several officers and their wives, and by wives and children of the Serjeants' Mess, Cosham. The social side of the event was undoubtedly a success, and, when the motor char-à-banc party left at about 7.45 p.m. to return, only expressions of satisfaction and delight were heard. The scores were as follows :—

Cosham	..	77	Netley	..	125

Lawn Tennis.—Lawn tennis is in full swing, and if there is not quite the quality of last year the courts are equally well patronized.

On Saturday, June 5, about 120 officers and their friends were gathered at the Mess Courts for an American tournament, and in beautiful weather a most enjoyable afternoon was spent. The tournament was played under sealed handicap in two divisions of ten couples each, the couples playing six games against every couple in the same division, the winners in the two divisions contesting the final. Considering the earliness of the season the play was of quite a high standard.

NOTES FROM WOOLWICH.—Serjt.-Major C. N. Primer writes :—

(1) The opening cricket match of the season was played against the Royal Army Medical Corps team, and the following represented the Company :—

Capt. A. S. Webley, R.A.M.C.	Capt. E. C. Hobbs, R.A.M.C.
Staff-Serjt. Lillywhite, R.A.M.C.	Staff-Serjt. Green, R.A.M.C.
Serjt. Taylor, R.A.M.C.	Pte. Waite, R.A.M.C.
Pte. McKenna, R.A.M.C.	Pte. Moxey, R.A.M.C.
Pte. Arnold, R.A.M.C.	Pte. Jarvis, R.A.M.C.

Pte. Turner, R.A.M.C.

Although the game resulted in a win for our opponents, good material, after a period of practice at the nets, will be available to pick teams from for future matches. Capt. E. C. Hobbs, R.A.M.C., gave a very fine exhibition of all-round play, 43 runs coming from his bat.

(2) A billiard handicap was arranged by the Recreation Committee and was recently held in the Company Recreation Room. After a very keen struggle in which some very five play was witnessed, the final was won by Pte. Waite, R.A.M.C., Staff-Serjt. Lewis, R.A.M.C., taking second prize. The highest break (42) was made by Corpl. Roberts, R.A.M.C. The following prizes were presented by Major H. S. Dickson, R.A.M.C., at the close of the final game:—

First Prize	..	Silver wristlet watch.
Second Prize	..	Leather attaché case.
Third Prize	..	Silver-mounted walking stick.
Fourth Prize	..	Silver cigarette case.

Highest breaks.

First Prize	..	Silver cigarette case.
Second Prize	..	Fountain pen.

(3) A fortnightly cinema performance continues to be given at the Hospital to the Staff and their friends, and judging by the number of the audience, is highly appreciated.

(4) The members of the Serjeants' Mess with their friends journeyed to Epsom on Derby Day to witness the great sporting event of the year. Leaving headquarters at 9 a.m. they travelled by motor char-à-banc through Beckenham, Croydon and Coulsdon. An excellent lunch was partaken by the party on the Downs and a most enjoyable day was spent in spite of several members having fallen into the hands of a Welsher. The catering arrangements were in the capable hands of S. M. Sproule, Serjt. Arnison and Mr. Nieass (ex-Serjt., R.A.M.C.), principal cook at the Royal Herbert Hospital, and gave the greatest satisfaction to all. The party returned to Headquarters by 9 p.m., and voted it as a Derby Day not to be quickly forgotten.

(5) A general meeting of the Company at which all ranks were well represented, was held on the 10th instant and arrangements made for the discovery of "hidden talent" by the holding during the season of monthly sports meetings, at which prizes will be awarded for each event. By this means it is hoped that the Company will speedily reach its pre-war standard of athletic excellence. Owing to the paucity of Royal Army Medical Corps personnel, the high level of local Royal Army Medical Corps talent of the past cannot be easily reached, although judging by the enthusiasm displayed great hopes are entertained of a successful season. Further news will appear in future issues of the Corps Journal giving the results of our meetings.

(6) The Royal Herbert Hospital has been selected as the central hospital for the Eastern Command for the holding of the Corps examinations, the first post-war series of examinations having taken place recently at which a large number of candidates attended—it is hoped successfully.

ROYAL ARMY MEDICAL CORPS ANNUAL DINNER, 1920.

The Annual Dinner was held at the Wharncliffe Rooms, Great Central Hotel, Marylebone, N.W.1, on Monday, June 14, at 7.45 p.m., the Director-General, Sir John Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., being in the Chair.

The number of officers of the Corps, past and present, attending was 175. Sir Vesey Holt, K.B.E., was the only guest.

The following is a list of the officers present:—

Lieutenant-Generals.—Sir John Goodwin, K.C.B., C.M.G., D.S.O., K.H.S. (Director-General); Sir William Babtie, V.C., K.C.M.G., C.B.; Sir Launcelotte Gubbins, K.C.B., M.V.O.; Sir Alfred Keogh, G.C.B., G.C.V.O., C.H.; Sir Arthur Sloggett, K.C.B., K.C.M.G., K.C.V.O.

Major-Generals.—Sir W. G. A. Bedford, K.C.M.G., C.B.; A. P. Blenkinsop, C.B., C.M.G.; Sir G. D. Bourke, K.C.M.G., C.B.; G. Cree, C.B., C.M.G.; J. C. Culling, C.B.; Sir William Donovan, K.C.B.; Sir T. J. Gallwey, K.C.M.G., C.B.; J. J. Gerrard, C.B.E., C.M.G., K.H.P.; Sir R. S. F. Henderson, K.C.M.G., C.B.; Sir S. Hickson, K.B.E., C.B.; W. W. Kenny, C.B.; S. Macdonald, C.B., C.M.G., K.H.P.; Sir J. Maher, K.C.M.G., C.B.; Sir W. G. Macpherson, K.C.M.G., C.B.; S. G. Moores, C.B., C.M.G.; Sir M. W. O'Keeffe, K.C.M.G., C.B.; Sir W. W. Pike, K.C.M.G., D.S.O.; Sir M. W. Russell, K.C.M.G., C.B.; Sir G. B. Stanistreet, K.B.E., C.B., C.M.G.; A. A. Sutton, C.B., D.S.O.; J. B. Wilson, C.B., C.M.G.; Sir H. R. Whitehead, K.C.B.; Sir M. T. Yarr, K.C.M.G., C.B.

Surgeon-General.—W. F. Burnett.

Brigadier-General.—W. W. O. Beveridge, C.B., C.B.E., D.S.O.

Colonels.—J. D. Alexander; A. W. Bewley, C.M.G.; E. T. F. Birrell, C.B., C.M.G.; E. W. Bliss, C.M.G., D.S.O.; H. A. Bray, C.B., C.M.G.; D. J. Collins, C.M.G.; R. J. C. Cottell;

C. R. Evans, D.S.O. ; P. Evans, C.M.G. ; Sir R. H. Firth, K.B.E., C.B. ; J. V. Forrest, C.B., C.M.G. ; H. W. Grattan, C.B.E., D.S.O. ; W. L. Gray, C.M.G. ; R. I. D. Hackett, C.B.E. ; L. W. Harrison, D.S.O. ; J. A. Hartigan, C.M.G., D.S.O. ; D. Harvey, C.M.G., C.B.E ; H. A. Hinge, C.B., C.M.G., D.S.O. ; H. E. R. James, C.B., C.M.G., O.B.E. ; R. Jennings, C.B.E. ; R. Kirkpatrick, C.B., C.M.G. ; G. T. Langridge ; Sir J. Magill, K.C.B. ; J. M. McMunn, C.B., C.M.G. ; G. A. Moore, C.M.G., D.S.O. ; C. K. Morgan, C.B., C.M.G. ; W. T. Mould, C.M.G. ; H. W. Murray ; A. Peterkin, C.B. ; C. E. Pollock, C.B.E., D.S.O. ; E. M. Pilcher, C.B., C.M.G., D.S.O., K.H.S. ; G. T. Rawnsley, C.B., C.M.G. ; O. L. Robinson, C.B., C.M.G., K.H.P. ; J. M. Sloan, C.M.G., D.S.O. ; F. Smith, C.B., C.M.G., D.S.O. ; G. St. C. Thom, C.B., C.M.G., C.B.E. ; C. R. Tyrrell, C.B., O.B.E. ; D. Wardrop, C.B., C.V.O. ; Sir Lisle Webb, K.B.E., C.B., C.M.G. ; T. du B. Whaite, C.B., C.M.G. ; R. J. Windle ; Sir E. S. Worthington, Knt., K.C.V.O., C.B., C.M.G.

Lieutenant-Colonels.—R. B. Ainsworth, D.S.O. ; J. A. Anderson ; H. V. Bagshawe, C.B.E., D.S.O. ; F. E. Barrow ; W. Benson, D.S.O. ; R. P. Bond ; C. G. Browne, C.M.G., D.S.O. ; U. J. Bourke ; H. O. B. Browne-Mason, D.S.O. ; W. Byam, O.B.E. ; A. B. Cottell ; P. Davidson, C.M.G., D.S.O. ; G. G. Delap, C.M.G., D.S.O. ; J. Dorgan ; F. G. Fitzgerald, D.S.O. ; J. G. Foster, O.B.E. ; J. A. Gormley ; A. C. H. Gray, O.B.E. ; A. R. Greenwood ; P. H. Henderson, D.S.O. ; J. W. H. Houghton, D.S.O. ; F. D. G. Howell, D.S.O., M.C. ; O. E. Ievers, D.S.O. ; A. D. Jameson ; J. C. Kennedy ; D. Lawson ; J. W. Leake, C.M.G. ; H. M. Morton, C.B., D.S.O. ; F. P. Nichols ; R. F. O'Brien ; W. W. Pope, C.M.G. ; R. L. Popham ; L. M. Purser, D.S.O. ; E. P. Sewell, C.M.G., D.S.O. ; J. B. Short ; W. C. Smales, D.S.O. ; H. E. Staddon ; A. B. Smallman, C.B.E., D.S.O. ; H. Spackman ; C. R. Sylvester-Bradley ; G. E. Twiss, C.M.G. ; N. D. Walker, O.B.E. ; J. W. West, C.M.G. ; E. M. Wilson, C.B., C.M.G., D.S.O.

Majors.—M. C. Beatty ; H. H. Blake, O.B.E. ; O. Cassidy, M.C. ; D. M. Corbett, O.B.E. F. C. Cowtan ; A. G. Cummins, M.C. ; G. de la Cour, O.B.E. ; H. S. Dickson ; R. M. Dickson, O.B.E. ; M. G. Dill ; P. G. Easton, C.B.E., D.S.O. ; T. Exton ; A. L. Foster ; W. R. Galway, O.B.E., M.C. ; J. H. Gurley, O.B.E. ; C. E. L. Harding ; H. P. Hart, M.C. ; W. J. S. Harvey ; H. L. Howell, M.C., O.B.E. ; J. du P. Langrishe, D.S.O. ; D. B. McGrigor ; E. M. Middleton, O.B.E. ; C. R. Millar, D.S.O. ; T. J. Mitchell, D.S.O, ; C. W. O'Brien ; E. C. Phelan, D.S.O., M.C. ; E. T. Potts, C.M.G., D.S.O. ; M. B. H. Ritchie, O.B.E., D.S.O. ; F. E. Rowan Robinson ; F. E. Roberts, D.S.O. ; J. W. L. Scott, D.S.O. ; G. G. Tabuteau, D.S.O. ; R. E. Todd ; E. W. Vaughan, D.S.O., M.C. ; J. A. W. Webster ; A. J. Williamson ; W. J. Waters, O.B.E. ; A. G. Wells, D.S.O. ; T. A. Weston ; F. Worthington, D.S.O., O.B.E,

Brevet Majors.—G. H. Dive, D.S.O. ; R. Gale, D.S.O. ; S. M. Hattersley, M.C. ; F. R. Laing ; A. D. Stirling, D.S.O.

Captains.—A. B. Allnutt, M.C. ; N. Cantlie, M.C. ; E. H. H. Elkington ; C. M. Finny ; C. L. Franklin, M.C. ; J. H. M. Frobisher ; J. K. Gaunt ; J. W. Lane ; O. W. McSheehy, D.S.O., O.B.E. ; J. H. Pendered, M.C. ; E. A. Strachan ; L. Way, D.S.O. ; H. J. G. Wells ; A. R. Wright, D.S.O. ; J. R. Yourell.

The following programme of music was performed during the evening by selected musicians of the Corps Band under the direction of the Bandmaster, Royal Army Medical Corps :—

PROGRAMME OF MUSIC.

1.	Selection	"The Yeomen of the Guard"	*Sullivan*
2.	Selection	"Monsieur Beaucaire"	*Messager*
3.	Valse	"Der Rosen Kavalier"	*Strauss*
4.	Selection	"Chu Chin Chow"	*Norton*
5.	Selection	"Scotch Airs"	—
6.	Morceau	"Salut d'Amour"	*Elgar*
7.	Selection	"Tannhäuser"	*Wagner*
8.	Suite	"A Lover in Damascus"	*Woodforde-Finden*
9.	Selection	"Irish Airs"	—
10.	Selection	"Mignon"	*Thomas*
11.	Selection	"The Mikado"	*Sullivan*
12.	Overture	"Raymond"	*Thomas*

GOD SAVE THE KING.

DINNER

On June 8 a dinner, under the Chairmanship of the Rt. Hon. the Earl of Midleton, K.P., was given in the Connaught Rooms, in "appreciation of the splendid services of the Army Medical Department and the eminent civilians attached to it during the war." Lieut.-Gen. Sir Alfred Keogh, G.C.B., G.C.V.O., was the principal guest of the evening.

It is hoped to publish a full report of the speeches in the next number of the Journal.

BIRTHS.

ELLCOME.—At Carisbrook, Isle of Wight, on June 17, the wife of Major J. E. Ellcome, of a daughter.

LARGE.—On May 30, at Castle Cot, Parsonage Lane, Clewer Without, Windsor, to Mrs. Stanley Large, wife of Capt. S. D. Large, D.S.O., M.C., Royal Army Medical Corps, a son.

DEATH.

GOODWIN.—On June 14, 1920, at Highwick, Newton Abbot, Devon, Surgeon-Major John Goodwin, late Army Medical Staff, aged 89.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels and Proceedings of the United Services Medical Society.

Any demand for reprints, additional to the above, or for excerpts, must be forwarded at the time of submission of the article for publication, and will be charged for at the following rates, and additional copies at proportionate rates:—

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		£ s. d.	£ s. d.	s. d.	s. d.	s. d.	s. d.
12	4	0 5 6	0 2 6	8 6	2 3	7 0	1 6
	8	0 10 0	0 5 0				
	16	0 16 6	0 8 6				
25	4	0 6 9	0 3 0	9 9	3 0	8 9	2 0
	8	0 12 0	0 5 9				
	16	1 1 0	0 10 6				
50	4	0 9 0	0 4 0	12 0	4 3	10 0	2 6
	8	0 15 0	0 7 0				
	16	1 6 6	0 12 6				
100	4	0 12 0	0 6 3	16 0	8 0	14 0	5 0
	8	1 0 0	0 10 0				
	16	1 17 0	0 15 6				
200	4	0 19 0	0 9 0	1 2 0	15 0	18 0	10 0
	8	1 10 0	0 14 0				
	16	2 12 0	0 18 0				

* These are not arranged as Reprints, but appear precisely as in the Journal with any other matter that may happen to appear on the first and last pages of the particular excerpt ordered.

CASES FOR BINDING VOLUMES.—Strong and useful cases for binding can be obtained from the publishers at the undermentioned rates:—

Covers, 3s. 9d. net; binding, 3s. 9d.
These charges are exclusive of cost of postage.

In forwarding parts for binding the name and address of sender should be enclosed in parcel.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 56, Cornwall House, Stamford Street, S.E. 1.

Communications have been received from the following: Col. Sir R. H. Firth, K.B.E., C.B.; Capt. J. H. Whiteside; Leonard Hill, Esq., F.R.S.; L. R. Broster, Esq.; L. G. Brown, Esq.

The following publications have been received:—

British: Tropical Diseases Bulletin, The Journal of the Royal Army Service Corps, The Medical Press and Circular, Guy's Hospital Gazette, The M dical Journal of Australia, The Indian Medical Gazette, The Medical Review, Proceedings of the Royal Society of Medicine, The Hospital. The Practitioner, The Royal Engineers Journal, The Royal Army Service Corps Quarterly, The Edinburgh Medical Journal.

Foreign: Le Bulletin Médical, Norsk Tidsskrift for Militaermedicin, Bulletin de l'Institut Pasteur, Medicina Militar, Archives Médicales Belges, Surgery, Gynæcology and Obstetrics, Bulletin de la Société de Pathologie Exotique, Archives de Médecine et de Pharmacie Navales, Archiv für Schiffs- und Tropen-Hygiene, Pathologie und Therapie exotischer Krankheiten, Bulletin of the Johns Hopkins Hospital, Office International d'Hygiène Publique, The Journal of Infectious Diseases.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 2d. per copy. (All subscriptions are payable in advance.)

Officers of the Royal Army Medical Corps possessing Diplomas in Public Health, etc., are kindly requested to register their special qualifications at the War Office. Letters of complaint are frequently received from officers stating that their special qualifications have not been shown in the Distribution List which is published as a supplement to the Journal in April and October of each year. As, however, the particulars of this list are supplied from official sources, officers are reminded that unless the possession of Diplomas, etc., has been registered at the War Office, no entry of such qualifications can be recorded in the Distribution List.

Letters notifying change of address should be sent to the Hon. Manager, "Journal of the Royal Army Medical Corps," Cornwall House, Stamford Street, S.E. 1, and must reach there not later than the 20th of each month for the alteration to be made for the following month's issue.

It is requested that all Cheques or Postal Orders for Subscriptions to the Journal, Corps News, Reprints, etc., be crossed "Holt & Co.," and made payable to the "Hon. Manager, Journal R.A.M.C.," and not to any individual personally.

All communications for the Hon. Manager regarding subscriptions, etc., should be addressed to

THE HON. MANAGER,
"JOURNAL OF THE ROYAL ARMY MEDICAL CORPS,"
CORNWALL HOUSE, STAMFORD STREET, S.E.1.

JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

AUGUST, 1920.

NOTES FROM NETLEY.—In spite of much rain and general inclemency of the weather, the Garden Party and the Gymkhana came off successfully. The attendance at the former was rather smaller than we expected, but there were occasional glimpses of sunshine and the courts were dry enough to permit of tennis after tea. Two distinct programmes were arranged for the Gymkhana, and it was not until the last moment that we decided to go through with the out-of-door events. An officers' fatigue got busy after dinner, and by 9 o'clock the lawns were fully illuminated. The most amusing items of the programme were a treasure hunt, and a display of magic indoors by Captain Shackleton, who arrived "through the skies" to the accompaniment of rockets and green flares, at 11 o'clock. Most of the events were decidedly original, and everyone voted the evening a complete success, although it is feared that a large number of evening shoes, brocade and otherwise, must have met with some damage.

The cricket match with Aldershot was unfortunately cancelled and the sports postponed.

An exciting cricket match took place on June 28, between the Officers and the Serjeants. The Officers batted first and scored 111. The Serjeants scored 110 for six wickets, when a remarkable collapse occurred, and the remaining four wickets fell without the addition of a run, the Officers thus winning by one, amid great excitement.

OFFICERS ROYAL ARMY MEDICAL CORPS *v.* SERJEANTS ROYAL ARMY MEDICAL CORPS.

Officers	
Capt. Rowley, c. McGibbon, b. Boxshall	26
Lieut.-Col. Greenwood, b. Boxshall	5
Capt. Keswick, c. McGibbon, b. Sullivan	38
Capt. Huntingford, c. Scott, b. Boxshall	21
Col. Moore, c. and b. Campbell	0
Dr. Rawlence, c. Kent, b. Campbell	5
Major Stephens, b. Campbell	4
Capt. McClelland, b. Campbell	0
Dr. McGrath, b. Sullivan	5
Capt. Elkington, b. Campbell	2
Capt. Andrew, not out	0
Extras	5
Total	111

1 for 6, 2 for 40, 3 for 59, 4 for 59, 5 for 59, 6 for 76, 7 for 76, 8 for 105, 9 for 109, 10 for 111

Serjt.-Major Boxshall	3 for 39	3 no-balls
Serjt. Campbell	5 for 54	
Qmr.-Serjt. Sullivan	2 for 13	

Serjeants	
Serjt. McIlravey, b. Capt. Rowley	4
Qmr.-Serjt. Sullivan, run out	22
Serjt. Campbell, c. Capt. Huntingford, b. Capt. Rowley	3
Mr. McGibbon, c. Col. Moore, b. Capt. Rowley	36
Mr. Ross, b. Capt. Huntingford	7
Serjt.-Major Boxshall, b. Capt. Huntingford	15
Staff-Serjt. Kent, b. Capt. Keswick	2
Serjt. East, b. Capt. Rowley	11
Serjt. Southern, run out	0
Staff-Serjt. Knight, not out	0
Qmr.-Serjt. Scott, b. Capt. Huntingford	0
Extras	10
Total	110

1 for 24, 2 for 32, 3 for 36, 4 for 65, 5 for 81, 6 for 83, 7 for 110, 8 for 110, 9 for 110, 10 for 110

Capt. Huntingford	3 for 30
Capt. Rowley	4 for 44
Capt. Keswick	1 for 17

Cricket.—The weather has been particularly unkind during the past month, and on the only occasions when play was possible the Garrison Team were victors.

NETLEY GARRISON *v.* THE DEANERY, JUNE 23.

Netley.		*The Deanery.*	
Mr. McGibbon, c. and b. Pitcher	39	Read, l.b.w. Campbell	10
Serjt. McIlravey, b. Wyeth..	9	Humby, c. and b. Campbell	13
Capt. Keswick, c. Russell, b. Read ..	26	Wyeth, b. Keswick	8
Capt. Rowley, b. Read	24	Capt. Pitcher, b. Campbell..	20
Capt. Huntingford, b. Read	16	Russell, c. McGibbon, b. Campbell ..	2
Qmr.-Serjt. Sullivan, l.b.w. Crampton ..	32	Christmas, c. McGibbon, b. Campbell ..	3
Lieut.-Col. Greenwood, b. Russell ..	2	Samways, l.b.w. Campbell	3
Serjt. Campbell, c. Toomer, b. Russell ..	0	Tuffin, c. Keswick, b. Campbell	3
Mr. Ross, b. Pitcher..	27	Lee, c. Ross, b. Huntingford	1
Capt. Reeves, not out	20	Gleave, c. Reeves, b. Campbell	16
Serjt.-Major Boxshail, c. Tuffin, b. Pitcher	0	Toomer, not out	13
Byes	4	Byes	8
Total	199	Total	100

NETLEY GARRISON *v.* TAUNTON SCHOOL, JUNE 30.

Netley.		*Taunton School.*	
Mr. McGibbon, l.b.w. de Forte	27	Page, c. Huntingford, b. Boxshall ..	8
Capt. Keswick, b. de Forte	31	Carter, b. Boxshall	2
Capt. Huntingford, c. Scudamore, b. de Forte	5	Cole, b. Boxshall	5
Serjt. Barber, c. Carter, b. de Forte ..	17	Bradfield, c, and b. Roxshall	2
Lieut.-Col. Greenwood, c. Cole, b. Carter	0	de Forte, c. Boxshall, b. Barber	28
Serjt. McIlravey, c. Dear, b. Carter ..	2	Toogood, c. Keswick, b. Barber	5
Serjt.-Major Boxshall, b. Carter	4	Scott, st. Scott, b. Keswick	6
Col. Moore, b. de Forte	0	Smith, c. Huntingford, b. Boxshall ..	7
Serjt. East, c. Smith, b. Carter	7	Scudamore, c. Col. Moore, b. Barber ..	16
Qmr.-Serjt. Scott, not out	10	Dear, not out..	10
Pte. Toole, c. Dear, b. de Forte	2	Parker, b. Huntingford	1
Byes	6	Bye	1
Total	111	Total	91

Tennis.—The only tournament was abandoned in mid-play owing to heavy showers. No play has recently been possible by reason of the inclement weather.

Band Week.—The Royal Army Medical Corps Depot Band visited Netley for the week July 5 to 10. The unfortunate weather prevented any out-door programme, but several performances were given in the Garrison Theatre to most appreciative audiences of staff and patients.

On the Wednesday the Royal Army Medical Corps Cricket Team, accompanied by the wives of the Non-commissioned Officers, came for their fixture with the Garrison Team, but once again the weather prevented play. An impromptu whist-drive at the Serjeants' Mess served to entertain the visitors until tea, and a band performance in the evening pleasantly occupied the time until the hour of departure.

Sports Day—originally fixed for Thursday, July 8—had to be postponed until July 15. An impromptu dance, for which the Band provided an excellent programme, proved most successful.

NOTES FROM WOOLWICH.—(1) Owing to the very indifferent weather and the frequent arrival of sick convoys from overseas, as much progress as desired has not been made in our sports meetings. A generous supply of all forms of sports gear has been purchased, and it is hoped that we shall be able to report more favourably in this direction in the near future. Great interest is being stimulated among the men by the hearty co-operation of Major H. S. Dickson, R.A.M.C., and Serjt.-Major J. Ryan, R.A.M.C., whose untiring efforts should meet their due reward by increased support on the part of the N.C.O.s and men. Too much stress cannot be laid on the fact that ultimate success in all forms of sport is based on the foundation of consistent practice.

(2) The Officers' and Sisters' Tennis Courts at the hospital have now been prepared and games commenced. On the 8th inst., the Matron (Miss M. E. Neville, R.R.C., Q.A.I.M.N.S.) and Sisters were "At home" on the Courts to the Officers and their friends. Tea was served and a most enjoyable time was spent.

(3) The fortnightly cinema performance is still given to the members of the staff and their friends. Under arrangements made by Lieut.-Col. R. Tilbury Brown, C.M.G., D.S.O., Officer Commanding Royal Herbert Hospital, we are able to secure and enjoy films directly they are released for public exhibition.

(4) A grand fête, military tournament and bazaar were held in the grounds of Hall Place, Bexley, on July 2 and 3, in aid of the Glentworth Ex-Service Men's Club, Dartford, by the courtesy of the Countess of Limerick. The fête was opened by H.R.H. the Duke of York and by Gen. Lord Horne, G.C.B., K.C.M.G. Serjt.-Major C. M. Primer and Ptes. Williams and Paviour, with twelve patients who had been wounded in the war, constituted part of the guard of honour. A first-aid tent was arranged by Serjt.-Major C. M. Primer and Ptes. Williams and Paviour, its equipment being lent from the Royal Herbert Hospital.

The guard of honour looked very smart, and the first-aid tent dealt with some minor injuries incurred during the sports.

NOTES FROM GIBRALTAR.—*Cricket.*—The cricket season has now been in full swing for several weeks, and some very good games have resulted. For one thing, we are not troubled with uncertain weather as at home, consequently the cricket is very consistent, and it is extremely gratifying that No. 28 Company, Royal Army Medical Corps, have been able to put up a show equal to some of the best, as we have to meet all comers and there are no "second elevens." Results of matches played to date are appended.

Boxing.—Pte. M. Carthy, Royal Army Medical Corps, in a recent boxing match gained the title of Feather-weight Champion of Gibraltar, after a strenuous and well fought six round contest, winning on points.

Racing.—During the past racing season some very good meetings took place both at North Front and Campamento; Major W. G. Wright's horse "Ultimo" won several important races, and was a very popular animal with followers of the "Turf."

ROYAL ARMY MEDICAL CORPS CRICKET CLUB.

Results of matches played: Played, 20. Won, 8. Drawn, 4. Lost, 8.

Batting Averages.

	Number of innings	Total score	Times not out	Highest score	Average
(1) Serjt. Huppler	16	622	2	102*	44·42
(2) Serjt. Warnes	17	352	1	64	22·00
(3) Major Meadows	17	296	1	46*	18·62
(4) Serjt. Taylor	20	372	—	65	18·60
(5) Cpl. Mulley	18	206	4	40*	14·71
(6) Col. Thurston, A.M.S.	5	41	1	27*	12·50
(7) Cpl. Sandys	7	63	1	21*	10·50
(8) Pte. Fowler	20	208	—	44	10·40

* Signifies not out.

Bowling Averages.

	Runs	Wickets	Overs	Maidens	Average
(1) Cpl. Sandys	210	28	78	16	7·50
(2) Major Meadows	278	32	89	8	8·68
(3) Col. Thurston, A.M.S.	80	8	23	1	10·00
(4) Serjt. Huppler	589	40	171	18	14·72
(5) Pte. Fowler	186	12	53	6	15·50
(6) Pte. Tait	364	23	92	11	15·82
(7) Major Parkinson	168	10	41	1	16·80

Catches.

(1)	Pte. Fowler	13
(2)	Serjt. Huppler	10
(3)	Major Meadows; Serjt. Taylor; Pte. Tait	8
(4)	Serjt. Warnes	7
(5)	Pte. Eaton	6
(6)	Major Parkinson; Cpl. Sandys	4

NOTES FROM SOUTH AFRICA:—

Considerable changes have been effected since the Imperial Garrison was withdrawn from South Africa in August 1914. Pretoria, Potchefstroom, Tempe and Maritzburg have all been handed over to the Union Government, and it appears to be the policy that no more Imperials are to garrison at these stations. The only Imperial station remaining is the Cape Command under Brigadier-General Ravenshaw and his staff, consisting of A.A. and Q.M.G., D.A., Q.M.G., Brigade Major and Administrative Departmental Headquarters Offices.

As far as the Royal Army Medical Corps are concerned there are only three regular officers

remaining in South Africa Wynberg Camp, which was throughout the war No. 1 General Hospital at the Cape Base, and which dealt with over 40,000 sick and wounded from various theatres of operations which is now being administered and staffed by Union Medical Officers, and is reduced to 200 beds dealing with the aftermath of the unfit South Africans returning from Europe.

What the future holds out regarding the prospects of the Imperial Regular Troops returning to South Africa is a matter which has not yet been decided, and at present only a nucleus of all Units is being retained pending decision.

Throughout the war the Cape Base has been extremely busy, and with our reduced numbers there has been no opportunity of engaging in any recreation or sports.

Serjt.-Major Fandam, late Chief Clerk to the Principal Medical Officer, South Africa, has applied for his discharge, after many years of faithful and good service rendered.

NOTES FROM SIERRA LEONE:—

It is some time since "Old Coasters" had any news from Sierra Leone. This is due to the fact that there has been nothing doing out here during the Great War, beyond the fact that troopships and others were collected here and made into convoys. I am told that as many as forty of them were lying in the harbour at times, waiting to be escorted home.

There was a big influenza epidemic in September, 1918, which practically decimated the native population.

Now that things are once more resuming their peace-time standard, more is being done on the social and athletic side. On Saturday and Sunday, April 17 and 18 of this year, the Royal Army Medical Corps Detachment were entertained in parties of eight each day at the Cape Lighthouse by their officers. The Commander of H.M.S. *Dwarf* very kindly lent his pinnace and a surf boat to get them there and back daily. He also provided a seine net for fishing. The parties embarked at the wharf at 8 o'clock a.m., arriving at the Lighthouse at 9 o'clock a.m. At the Lighthouse the parties were given lunch and tea; the arrangements for these meals were very kindly undertaken by the wife of our Senior Medical Officer. Before and after lunch the men bathed, or fished, returning by launch, leaving the Lighthouse at 5 o'clock p.m. Some so far enjoyed themselves bathing as to forget about the sun, with the result three had to be excused duty for several days on account of being badly blistered. All the men were unanimous in their praise and appreciation of the day's outing and the arrangements made for their entertainment and "chop."

The King's birthday was celebrated by a ceremonial parade at 8 o'clock a.m. of all the troops in the Command, His Excellency the Governor taking the salute. The troops made an excellent display, which was much appreciated by a large attendance of civilians and natives. In the evening His Excellency the Governor held a reception at the Government House.

A Football League has now been formed; the Clubs are playing for League medals. The Clubs are 50th Company Royal Garrison Artillery, Staff and Departmental, H.M.S. *Dwarf*, 36th Company Royal Engineers and the Commercials. The games are played twice a week at the King Tom Football Ground and produce large crowds of Europeans and natives. At present we have five of our Detachment in the Staff and Departmental Club.

There are also two new squash courts in the process of making for other ranks, and there is a tennis court for N.C.O.'s; also a thirty feet swimming bath open to N.C.O.'s and men four days each week.

The rainy season has just started, but so far no one is very depressed by it as games have not been interrupted very often. The tornado season this year was a very mild one.

The Entertainment Fund for Royal Army Medical Corps has just been re-opened and is subscribed to each month by the officers of the Royal Army Medical Corps of the Command, and after the rainy season is over it is hoped to start a Gymkhana, which I understand used to be one of the most popular and looked-for events in the Station.

Since the beginning of the year the following Officers and Warrant Officers have left the Station: Major H. C. Hildreth, D.S.O., Royal Army Medical Corps; Capt. R. C. Aitchinson, Royal Army Medical Corps; Capt. E. ff. Creed, Royal Army Medical Corps; Capt. G. C. Robinson, Royal Army Medical Corps; Capt. J. J. H. Beckton, Royal Army Medical Corps; 16231 Qmr.-Serjt. Mason, D.C.M., Royal Army Medical Corps; and the following have arrived: Lieut.-Col. J. F. Martin, C.M.G., C.B.E., Royal Army Medical Corps; Major G. F. Rudkin, D.S.O., Royal Army Medical Corps; Capt. E. W. Wade, D.S.O., Royal Army Medical Corps; Capt. W. L. E. Reynolds, M.C., Royal Army Medical Corps; Capt. H. T. Findlay, Royal Army Medical Corps; 17870 Serjt.-Major E. Cragg, Royal Army Medical Corps; 22 Qmr.-Serjt. R. Church, Royal Army Medical Corps.

ROYAL ARMY MEDICAL CORPS FUND.

The eighteenth Annual General Meeting of the Royal Army Medical Corps Fund was held at the Royal Army Medical College on June 14, 1920, with the Director-General, Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., in the chair. A large number of officers were present.

(1) The minutes of the last Annual General Meeting, held on June 11, 1919, were read, approved and signed.

(2) The Secretary read the report for the year 1919 as follows:—

REPORT.

(i) *Officers' Branch.*—The number of annual subscribers has increased from 1,047 in 1918 to 1,073. Nearly all the young officers have joined in response to notices sent to them and replies are still coming in which will take effect in 1920.

(ii) The income amounted to £1,402 13s. 10d., and the expenditure to £2,201 0s. 5d. This increase of expenditure was caused under the heads of

(a) *Memorials.*—The cost of the special portrait of Sir A. Keogh, the portrait of Sir A. Sloggett, and part payment of Memorial to certain distinguished officers authorized by Annual General Meeting held in June, 1918.

(b) *Dinner.*—The additional expense due to the entertainment of representative officers of all branches of the Royal Army Medical Corps to meet His Royal Highness Field-Marshal the Duke of Connaught on his accepting the position of Colonel-in-Chief of the whole Corps.

(c) *Band.*—A larger grant, as recommended by the Annual General Meeting in 1919.

(iii) The difference between income and expenditure was met by the absorption of the credit balance from 1918 and by the sale of a portion of the £800 National War Bonds invested in 1918 with a view to its being utilized after the war—£500 of the National War Bonds still remains available and the former investments of this Branch, value nearly £5,000, are still untouched.

(iv) A grant of £20 was made to the widow of a deceased officer under the special circumstances referred to in Rule 5.

(v) *General Relief.*—Grants and subscriptions from officers, companies and units abroad amounted to £2,426 3s. 1d. and as the applications for assistance continued to be few in number a further sum of £1,400 was invested in the New Funding Loan and National War Stock 1920-1947. A special donation was made to the Union Jack Club in addition to the annual subscription, and the usual subscriptions to other societies have been paid, as well as a share of the office expenses.

(vi) *Schools.*—Grants were made to the Royal School for Daughters of Soldiers at Hampstead, The Royal Drummond Institute and the Home for Destitute Catholic Children. There still remains in this sub-branch a sum of £129 3s. 7d.

(3) With reference to the grant of £20 made to the widow of a deceased officer under the special circumstances referred to in Rule 5, the Secretary explained that this was the same widow who had £30 under (5) in 1918.

The Secretary also mentioned that since this report was made out a further grant had been received from No. 2 Stationary Hospital, specially allocated to schools.

(4) Proposed by the Director-General, and carried unanimously, that the report be adopted.

(5) Proposed by Col. E. M. Pilcher and seconded by Lieut.-Gen. Sir William Babtie, that the accounts, as presented, be adopted. Carried.

(6) The Secretary explained the objects of the General Relief Branch, when it was proposed by Major-General Sir W. Donovan, and seconded by Lieut.-Col. A. B. Cottell, that a grant of £25 be made from the Officers' Branch to the General Relief Branch. Carried.

(7) *Band.*—The Secretary explained that he had heard from Captain Allnutt to the effect that the balance-sheet of the Band Accounts will not be ready until July. A statement had, however, been rendered.

On the question of the Band Accounts, it was pointed out that the Band President had asked for a grant of £600.

Lieut.-Col. W. Benson said that to pay the present Bandsmen will require at least £600 a year. The Fund has the money. It is a question of voting the grant.

Sir William Donovan asked if the Government would be likely to contribute. The Chairman thought not.

Sir Walter Bedford asked whether the men draw Corps pay, and was answered in the negative.

The Chairman inquired whether the money was available.

The Secretary replied that £100 had already been given during this year, and that if a further sum of £500 were now voted to bring the total up to £600, probably a small portion of the £500 War Bonds would have to be sold to meet this expense.

Sir M. W. Russell asked whether the charge would be recurring and Col. Benson agreed that it would.

Lieut.-Col. Benson added that no Bandsmen are now coming forward, and those at present forming the Band are very bad—not able to compete with the worst Band in the Army.

Proposed by Lieut.-Gen. Sir William Babtie and seconded by Major-Gen. Sir James Maher that a further donation to the Band of £500, making a total for the year of £600, be granted. Carried unanimously.

(8) *Memorials.*—(*a*) The Secretary reported that the only outstanding Memorial at the present time is that which has just been completed by Mr. Colton, of the five distinguished officers who were principally concerned in the unification of the Corps.

Major Middleton: With regard to the site of this Memorial, it is proposed to put it up over the mantelpiece in the ante-room. This would necessitate taking away a large portion of the oak panelling, to give way to an artistic Memorial. It does not seem to me to be the appropriate position, and I should like to propose that some other site be found.

Major Dive: I would like to second that another site be found, and that the oak panelling should remain inviolate.

Lieut.-Col. A. B. Cottell said that he would like the oak panelling to remain in its place.

Sir William Babtie pointed out that the proposal had been before the meeting last year, and the ante-room had been decided upon at that meeting as the appropriate place for the Memorial, the advice of the artist having first been obtained after a thorough inspection of the Mess and College. The tablet had been designed in accordance with the lighting of the position chosen for it.

The Chairman read an extract from para. (1) (i) of the Report of the Seventeenth Annual Meeting, June 11, 1919, as follows: "A Memorial is also in progress to commemorate certain officers who were specially distinguished in the unification of the Army Medical Services and the formation of the Royal Army Medical Corps, and I hope it will shortly be completed and placed in the College Mess."

Col. Pope said that, this site having been chosen by the artist and the tablet designed accordingly, a very large sum of money would probably be almost thrown away if it is decided to place the tablet in another position.

Sir William Babtie then explained the origin and progress of the scheme, and concluded by saying that the full artistic value of the Memorial would certainly be lost if it were placed in a different position from that for which it was designed, and that it was necessary to take very great care before reversing the decision already made as to site which had been fully approved by former Commandants.

Sir Walter Bedford asked what guarantee there would be that this tablet might not be followed by others.

Col. Lelean said that the general opinion of the Mess is very strong that the oak panelling makes the whole character of the room, and that there is a general fear of this Memorial being taken as a precedent.

Major Middleton: I propose that this Memorial be not placed over the mantelpiece in the ante-room.

It was proposed as an amendment by Col. Pope and seconded by Col. Tyrrell that the Memorial should be placed in the position originally selected by the Committee, that is, in the ante-room over the mantelpiece. In favour, 13; against, 29. The original proposal, namely, that the Memorial shall not be placed in the site selected, was therefore carried.

During the lengthy discussion which preceded this decision, various other suggestions were made. Lieut.-Col. A. B. Cottell proposed and Major Dive seconded: "That this bronze memorial may be placed over the mantelpiece in the lounge facing the river, where it will not disturb the oak panelling."

Another officer suggested that the tablet should be placed over the mantelpiece in the library. Col. Peterkin suggested that the artist should be informed of the opposition to the proposed site, and asked to select another. Col. Cottell seconded that proposal. Col. Forrest said he would like to make a small addition to the same proposal, "that, when the matter is considered, representatives of the Mess Committee should serve on whatever body discusses the matter with the artist." It was then pointed out that this was already the case, the Commandant of the College being a permanent member of the Committee. An officer suggested that the Committee should be given full power to put the tablet anywhere except the three public rooms of the Mess. The Chairman asked: "Is it your wish that the Committee be empowered to act after consultation with Mr. Colton, and that the expenditure of whatever sum is necessitated by the change of site be authorized?"

Sir William Babtie suggested that a fresh Memorials Sub-Committee should be elected, and

Col. Tyrrell also expressed a wish to resign, but upon the representations of the Chairman, Sir M. W. Russell and Sir W. Donovan, this was not pressed.

The Chairman: I would propose for your consideration that this question be referred to the Memorials Sub-Committee, and that we give the Royal Army Medical Corps Fund Committee power to act in conjunction with the Memorials Sub-Committee.

Sir William Babtie thought that the Memorials Sub-Committee could not now act in conjunction with the Mess Committee or with any authority less than the Fund Committee, and the Chairman read over the Constitution of the Royal Army Medical Corps Fund Committee to the meeting.

Proposed by Lieut.-Col. R. T. Brown and seconded by Major Dunbar Walker, that power be given to the Royal Army Medical Corps Fund Committee, in conjunction with the artist, to select another site in the Mess or College excluding the ante-room, the mess room, and the smoking room, and to expend sufficient money to cover the additional cost. In favour, 29; against, 12. Carried.

(*b*) The Secretary said that a proposal had been brought forward by the present Commandant of the College to complete the collection of Victoria Cross Pictures at the College by the addition of pictures representing the deeds for which the decoration was conferred during the late war. A meeting had been held at the College, and the question was referred to the Memorials Sub-Committee, to make the necessary investigations and report to the Annual General Meeting in June. The question as to whether the Memorial should be strictly confined to Officers of the Regular Army had been considered, and it had been decided to recommend to the Annual General Meeting that all Officers, whether Regular, Temporary Commission, Special Reserve or Territorial Force, should be included. Inquiries had been made of the President of the Royal College of Art, and the pictures of two artists, both of whom had been combatant officers during the war, had been seen at their studios and at the Royal Academy by Colonel Pope and the Secretary.

Proposed by Colonel Hinge and seconded by Colonel H. W. Murray that the Victoria Cross Memorial pictures be completed by the addition of eight, representing those officers who have been awarded this decoration during the late war; also that the Annual General Meeting be asked to authorize the expenditure of a sum not exceeding £300 for this purpose; also that the Committee and Memorials Sub-Committee be empowered to arrange all details, subject to the proviso that the whole series of present and future paintings shall be as far as possible of a uniform character. Carried unanimously.

(9) The question of voting a grant from the Officers' Branch to the Fund for a special Memorial to the Royal Army Medical Corps who have fallen during the war which had been postponed from last year was next considered.

Sir W. Donovan asked whether any information was to hand as to the nature of the Memorial.

The Chairman explained that this could not be decided upon until the total amount of money obtained had been determined. At present there is from £14,000 to £15,000, and subscriptions are still coming in. Until the amount of money to be expended and the nature of the Memorial settled, it is not possible to allocate a site. He then inquired what money is available for the purpose.

The Secretary explained that the meeting had already voted away approximately £1,400, and that the balance in hand and to come in the immediate future amounted to approximately £1,200, so that in any case some War Bonds will have to be sold.

Proposed by Sir William Donovan, and seconded by Col. H. W. Murray, that a grant of 100 guineas be paid from the Officers' Branch to the General Memorial Fund for officers and men of all branches of the Corps. Carried.

(10) (i) Proposed by Sir M. W. Russell: That the Secretary's salary should be raised to £200 a year and that the Funds should pay all necessary office expenses supported by satisfactory vouchers. The Royal Army Medical Corps Fund Officers' Branch and the General Relief Branch will each continue to pay one-third of the total amount, and the Benevolent Society the remaining third according to the existing agreement approved by the Annual General Meeting on June 11, 1917. The decision to take effect from January 1, 1920. Carried unanimously.

(ii) It was proposed, seconded, and carried unanimously, that in Rules 8 and 9 the words "not exceeding £6" be altered to "not exceeding £10," so as to admit of a somewhat larger grant being made to families in cases of urgent necessity.

(11) It was proposed by Col. Tyrrell that the present auditors, Messrs. Evans and Peirson, be re-elected. Carried.

(12) It was proposed by Lieut.-Col. A. B. Cottell, and seconded by Col. Tyrrell, that Lieut.-Col. E. M. Wilson be re-elected as Secretary for one year. Carried unanimously.

STATEMENT OF ACCOUNTS OF THE OFFICERS BRANCH FOR THE YEAR 1919.

RECEIPTS.	£	s.	d.
To Balance at Bank, December 31, 1918	639	4	9
,, Subscriptions	1,077	0	6
,, Dividends:—			
Caledonian Railway, less Tax	39	8	6
North British Railway, less Tax	40	16	0
£800 National War Bonds	40	0	0
£2,300 National War Loan	115	0	0
,, Office Expenses for 1918 repaid by General Relief Branch	71	7	3
,, Office Expenses for 1918 repaid by Benevolent Society	71	7	3
,, Grant for 39th General Hospital from Relief Branch	6	14	4
,, From Capt. J. T. Clapham repaid for Shorthand Clerk	0	10	6
,, Sale of Old Typewriting Machine	1	0	0
,, Sold by Order of the Committee 300 National War Bonds	293	5	0
	£2,395	14	1

EXPENDITURE.	£	s.	d.	£	s.	d.
By Grants to Band				250	0	0
,, Fire Insurance for Q.A.M. Hospital Chapel				4	5	6
,, Royal School for Officers' Daughters				26	5	0
,, Capt. J. T. Clapham for Press Cuttings				2	8	0
,, General Relief Branch by Annual General Meeting				25	0	0
,, Messrs. Evans, Peirson & Co.				6	6	0
,, Special Grant under Rule 5				20	0	0
,, Refund of Subscription credited in error				1	0	0
,, Cheque Book				0	8	4
,, Mr. F. O. Salisbury, Portrait of Sir A. Sloggett				183	15	0
,, Mr. A. Hacker, Portrait of Sir A. Keogh				438	10	0
,, Mr. W. R. Colton, Memorial to Distinguished Officers—Part Payment				200	0	0
,, R.A.M.C. Dinner Fund				709	2	6
,, Capt. A. R. Wright, Personal Expenses, R.A.M.C. Memorial				2	9	4
,, Purchase of Col. W. Johnston's "Roll of the Corps"				1	1	9
,, Commandant of College, Repainting, etc., of Pictures				114	14	6
,, *Office Expenses:—						
Office Allowance	£180	0	0			
Shorthand Clerk	1	11	6			
Stationery, Printing and Postage	22	5	6			
Telephone	8	10	0			
Repair of Typewriting Machine	1	5	6			
Repair of Office Furniture	2	2	0			
				215	14	6
				2,201	0	5
,, Balance with Messrs. Holt and Co.				194	13	8
				£2,395	14	1

* (Two-thirds of this will be repaid in 1920; one-third by R.A.M.C. Benevolent Society, and one-third by the General Relief Branch.)

INVESTMENTS.	£	s.	d.
Caledonian Railway 4½ % Stock	1,408	0	0
North British Preference Stock	1,457	0	0
5 % War Stock 1929/47 (cost £2,186 7s. 11d.)	2,300	0	0
5 % National War Bonds, 1927	500	0	0
	£5,665	0	0

We have compared the above Statement with the Books and Vouchers relating thereto, and certify it to be correct. We have verified the Bank Balance and Investments.

Portland House.
Basinghall Street, E.C.
March 19, 1920.

(*Signed*) EVANS, PEIRSON & CO.,
Chartered Accountants.

STATEMENT OF ACCOUNTS OF THE GENERAL RELIEF BRANCH FOR THE YEAR 1919.

Receipts.

	£	s.	d.
To Balance in hand, December 31, 1918	592	2	2
,, Grants from Companies and Units	1,972	3	2
,, Subscriptions and Donations	453	19	11
,, Dividends—			
£606 1s. 3d. Canada Railway Stock	16	19	4
£1,060 East India Railway 3½ %	25	19	4
£2,800 National War Bonds	136	12	2
£3,556 18s. 11d. War Loan Stock	162	1	6
£1,000 Funding Loan	10	4	2
,, Rebate of Income Tax, 1918	18	8	2
,, Schools Account, as per attached Statement, Interest on Deposit Account	2	10	1
	£3,391	0	0

Investments.

	£	s.	d.
Canada 3½ % Stock 1930/50	606	1	3
East India Railway 3½ % Debenture Stock	1,060	0	0
National War Bonds 5 %	2,800	0	0
5 % War Stock 1929/47 (cost £3,380)	3,556	18	11
4 % Funding Loan 1960/90 (cost £800)	1,000	0	0
	£9,023	0	2

Expenditure.

		£	s.	d.
By Grants to Soldiers and Widows, etc.		159	0	0
,, Union Jack Club		50	4	0
,, Incorporated Soldiers and Sailors Help Society		5	0	0
,, National Association of Employment for Ex-Soldiers		5	0	0
,, Corps of Commissionaires		10	0	0
,, Transfer to R.A.M.C. Auxiliary Fund, three-fourths of cheque from Guernsey		82	11	5
,, ,, Benevolent Society, part of Gen. Fell's cheque		150	0	0
,, ,, Army and Navy Male Nurses, part of Gen. Fell's cheque		50	0	0
,, ,, R.A.M.C. Auxiliary Fund, one-half of cheque from 7th Cavalry F.A.		7	13	11
,, ,, Officers Branch, part of cheque from 39th General Hospital		6	14	4
,, ,, R.A.M.C. Auxiliary Fund, part of cheque 106th F.A.		109	15	5
,, ,, R.A.M.C. Auxiliary Fund, part of cheque from 18th F.A.		15	0	0
,, ,, R.A.M.C. Auxiliary Fund, part of cheque from 104th F.A.		28	6	8
,, ,, R.A.M.C. Auxiliary Fund, three-fourths of cheque from X Corps		150	0	0
,, Share of Office Expenses, 1918		71	7	3
,, Purchase of £1,000 4 % Funding Loan		800	0	0
,, ,, £630 12s. 11d. War Stock 1920/47		600	0	0
,, Bankers' charges, Recovery of Income Tax, Cheque Book, etc.		1	3	7
		£2,301	16	7
Less Mrs. Luker's cheque not presented		3	0	0
		£2,298	16	7
,, Schools Account as per Statement enclosed		32	17	0
		£2,331	13	7
,, Balance—General Relief	£1,030 2 10			
Schools	29 3 7			
		1,059	6	5
		£3,391	0	0

We have compared the above Statement with the Books and Vouchers relating thereto, and certify it to be correct. We have verified the Bank Balance and Investments.

Portland House,
Basinghall Street, E.C.
March 19, 1920.

(*Signed*) EVANS, PEIRSON & CO.,
Chartered Accountants.

STATEMENT OF ACCOUNTS OF THE COMPASSIONATE SCHOOL FUND FOR THE YEAR 1919.

Receipts.	£ s. d.	Expenditure.	£ s. d.	£ s. d.
To Balance in hand, December 31, 1918..	59 10 6	By Royal School at Hampstead		10 17 0
,, Deposit Account	100 0 0	,, Royal Drummond Institute, Dublin..		12 0 0
,, Interest on Deposit Account	2 10 1	,, Catholic Home for Destitute Children		10 0 0
				32 17 0
		, Balance at December 31, 1919—		
		Current Account (included in General Relief Fund Balance, £1,059 6s. 5d.)	29 3 7	
		Deposit Account	100 0 0	129 3 7
	£16 0 7			£162 0 7

We have compared the above Statement with the Books and Vouchers relating thereto, and certify them to be correct. We have verified the Bank Deposit Account.

Portland House,
Basinghall Street E.C.
March 19, 1920.

(*Signed*) EVANS, PEIRSON & CO.,
Chartered Accountants.

ROYAL ARMY MEDICAL CORPS BAND.

Statement of Accounts, April to June, 1920.

Receipts.	£	s.	d.	Expenditure.	£	s.	d.
Brought forward	80	13	10	Salaries	54	12	0
R.A.M.C. Fund	100	0	0	Band Travelling Expenses	3	18	0
Sale of Surplus Instruments	22	10	0	Band Pay	80	15	3
				Music and Repairs	1	10	3
				Postage	0	3	2
				Total Expenditure	£140	18	8
				Balance	62	5	2
	£203	3	10		£203	3	10

Crookham Camp, Aldershot,
June 30, 1920.

E. B. ALLNUTT, *Captain and Adjutant,*
Depot R.A.M.C., Band President.

PROCEEDINGS OF A COMMITTEE MEETING HELD AT THE WAR OFFICE, WHITEHALL, ROOM 266, ON JUNE 21, 1920.

Present.

Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., Director-General, in the chair.
Major-Gen. Sir G. B. Stanistreet, K.B.E., C.B., C.M.G., Deputy Director-General.
Major-Gen. Sir W. Donovan, K.C.B.
Col. Sir J. Magill, K.C.B.
Col. O. L. Robinson, C.B., C.M.G., K.H.P.
Col. C. R. Tyrrell, C.B., C.B.E.
Lieut.-Col. P. S. Lelean, C.B., C.M.G.
Major P. G. Easton, C.B.E., D.S.O.
Capt. E. B. Allnutt, M.C., Band President; also
Lieut.-Gen. Sir W. Babtie, V.C., K.C.B., K.C.M.G., Chairman of Memorials Sub-Committee, and Lieut.-Col. W. W. Pope, C.M.G.

(1) Lieut-Col. P. S. Lelean took his seat as a Professor at the College vice Sir W. H. Horrocks, K.C.M.G., C.B.

(2) The minutes of the meeting held on April 14, 1920, were read and confirmed.

(3) The Secretary read the report of the proceedings of the Annual General Meeting held on June 14, 1920.

(4) On the question of para. 5 of the proceedings in which the Annual General Meeting decided (1) that "the Bronze Memorial to five distinguished officers of the Corps shall not be placed in the ante-room over the mantelpiece," i.e., in the position which had been selected by the Committee on the recommendation of the Memorials Sub-Committee and the artist, and (2) that "power be given to the Royal Army Medical Corps Fund Committee in conjunction with the artist to select another site in the Mess or College, excluding the ante-room, mess room and smoking room, and to expend sufficient money to cover the additional cost."

The Secretary read the minutes of the various meetings of the Committee and Sub-Committee ever since the subject was first initiated in April, 1918.

Sir William Babtie said that he was glad to have it made clear from the minutes just read that the Memorials Sub-Committee had not taken undue responsibility in this matter, but had acted throughout with the knowledge and sanction of the full Committee and of the Commandants concerned.

Col. O. L. Robinson and Lieut.-Col. P. S. Lelean explained their views.

After full discussion it was proposed by Col. C. R. Tyrrell and seconded by Col. O. L. Robinson—

(i) That the Committee agree that the decision regarding the site of the bronze tablet should be postponed until the next Annual General Meeting.

(ii) That meanwhile the artist be consulted as to the selection of a suitable site or sites.

(iii) That the bronze tablet be temporarily deposited in the College under the charge of the Commandant, with a request that it may be placed in a selected position in the College or Mess where it shall remain until next year in order that all officers may have the opportunity of seeing it.

(iv) The Committee undertake to submit a recommendation to the Annual General Meeting as to a site.

These resolutions were carried unanimously.

(5) The Secretary was authorized to arrange payment with the artist for the work already done.

(6) It was proposed that Col. O. L. Robinson should join the Memorials Sub-Committee and carried.

(7) The Director-General proposed a very cordial vote of thanks to the Memorials Sub-Committee and to Mr. W. R. Colton, R.A., the artist, for the trouble they have taken in the whole matter. This was seconded by Col. O. L. Robinson and carried unanimously.

(8) Capt. A. R. Wright, the Hon. Secretary of the Dinner Sub-Committee, submitted and explained the Dinner accounts which were passed for payment.

(9) The Secretary reported that the proportion of office expenses for 1919 has been paid by the General Relief Branch and the Officers' Benevolent Society, to the Officers' Branch, viz., one-third in each case of the total expenses, each share amounting to £71 18s. 2d.

(10) *General Relief Branch.*—(i) The following donations were reported since last meeting, 14.4.20.

*19.4.20.	Dartford War Hospital, Col. R. P. Bond	£14 2 0
*21.4.20.	19 Company, Kinmel Park Camp	20 0 0
24.4.20.	Royal Army Medical Corps Record Office, Serjeants' Mess	10 0 0
*28.4.20.	U.S. Trustee, from 49th General Hospital	12 0 2
3.5.20.	Dartford War Hospital, Serjeants' Mess	3 6 0
*5.5.20.	No. 5 Con. Depot, U.S. Trustee	12 11 7
*7.5.20.	From Benev., per U.S. Trustee	135 5 6
*20.5.20.	141st Field Artillery, from Depot	16 0 0
*2.6.20.	From Auxiliary Royal Army Medical Corps Fund, per U.S. Trustee	122 10 7
*7.6.20.	Military Hospital, Warlingham	25 0 0
		£370 15 10

* Proportion allotted to this Fund of larger cheques received, the balances of which have been allotted by the donors to other Funds.

(ii) Five small grants made under Rule 9 since last meeting amounting to £12 were submitted and approved.

(iii) Three fresh applications under Rule 8 were submitted, and the Secretary drew attention to the alteration in the Rule authorized by the Annual General Meeting raising the maximum grants payable in six months from £6 to £10.

Grants were authorized as follows:—

The widow of Pensioner W. E., ill-health	£4 0 0
The widow of J. P., ill-health	4 0 0
Mrs. V. M. B. for children	4 0 0

(11) The Secretary reported correspondence that had taken place with the United Services Trustee and the Auxiliary Royal Army Medical Corps Fund regarding the distribution of certain sums received by both Societies from the United Services Trustee and other sources, being amounts allotted from canteens and recreation rooms of various hospitals and other units on their being closed on demobilization.

The system in existence at the present time agreed to by the Auxiliary Royal Army Medical Corps Fund, by which all such amounts are divided in two equal shares between the two Funds, unless special instructions were received from the donors, was considered to be a fair distribution, and its continuance for the present was approved.

(12) The Secretary was directed to consult with the Trustees and Messrs. Holt and Co. as to the investment of part of the balance in the current account, not exceeding £800, in a suitable security.

(13) *Schools.*—The Secretary reported that letters of thanks had been received from the Drummond Institution and the Home for Destitute Catholic Children for the donations voted at the last meeting; also that the child of an N.C.O. which was being educated at the Convent of St. Vincent de Paul had been removed by the father on his marrying again, and that the father expressed his thanks to the Committee for what they had done in his case.

ROYAL ARMY MEDICAL CORPS OFFICERS' BENEVOLENT SOCIETY.

THE Annual General Meeting of the Royal Army Medical Corps Officers' Benevolent Society was held at the Royal Army Medical College on June 14, 1920, with the Director-General, Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., in the chair.

There was a full attendance of officers.

(1) The Minutes of the last Annual General Meeting held on June 11, 1919, were read and confirmed.

(2) The Report of the Committee for the year 1919 was considered as follows:—

REPORT.

(i) The total subscribers for the year has increased from 291 in 1918 and 181 in 1917 to 390; and a considerable number of additional officers have joined from the commencement of the year 1920 in consequence of the special appeal sent out by the Committee on the occasion of the centenary of the Fund. The amount received in subscriptions in 1919 was £425 7s. 6d. as against £316 19s. 6d. in 1918.

(ii) Donations were received from—

Mrs. A. W. Hooper..	£12	2	0
Lieut.-Col. J. B. Riddick	5	0	0
45th Indian General Hospital, per Lieut.-Col. D. Renton ..	20	10	0
Rouen Medical Society	10	17	8
3rd Prisoners of War Company by Lieut. Streeter	1	18	7
Mrs. MacBean and Miss Allan	5	0	0
Brig.-Gen. M. H. G. Fell, C.B., C.M.G.	150	0	0
Royal Army Medical Corps Depot, Deolali, India	25	0	0
Capt. C. Greenhough	3	0	0
Sir James Galloway, K.B.E., C.B.	3	3	0
*84th General Hospital, East Africa, Officers' Mess	32	15	5
*4th and 53rd Stationary Hospitals	10	15	0
	£280	1	8

* Proportion of larger cheques from these units allotted to this Fund, the balances being allotted to other funds.

(iii) The actual receipts from all sources after deducting transfers to other funds in accordance with the wishes of the donors, amounted to £1,721 5s. 10d. as against £1,409 18s. in 1918, and the actual expenditure after making similar corrections to £1,386 17s. 6d. as against £920 7s. 9d. in 1918.

(iv) Thirty-six applicants representing sixty-seven orphans were granted £1,300.

The Secretary stated that since the Report was drawn up the membership had risen to over 500, in response to the appeal issued by the Committee in connection with the centenary of the Fund; also that an additional sum of £70 had been received as a grant from a hospital on closing.

The Report was approved and the audited statement of accounts for the year 1919 were examined and passed.

(3) On consideration of the grants to orphans recommended by the Committee the Secretary said that in some cases small grants had been made in advance, but that after the receipt of the rebate on Income Tax for the year 1919 and the Dividends payable during the second half of the year there would be enough money, not only to pay all the recommended grants in full, but also to leave a margin of approximately £400 in hand; there might, however, arise some further urgent cases during the latter half of the year. The Secretary further intimated that there were one or two cases in which the meeting might reduce the grants recommended to the extent of about £5 without causing hardship.

The Chairman thought it would be better to pass the recommended grants as they stand, and at the same time to authorize the Secretary to report to the Committee any cases in which the proposed grants may be reduced without hardship.

This proposal was put to the meeting, and carried unanimously.

(4) (i) The proposal made by the Royal Army Medical Corps Fund "that the Secretary's salary shall be raised to £200 a year, and that the Funds will pay all necessary office expenses, the Benevolent Society contributing one-third of the total cost in accordance with the arrangement approved by the Annual General Meeting on June 11, 1917; this decision to take effect from January 1, 1920," was next put before the meeting and approved.

(ii) The proposal made by the Committee that the words "not exceeding £25" in Rule 31 be altered to "not exceeding £50," &c., was next put before the meeting and approved. In this connexion the Secretary pointed out that very often a sum of £20 given at one time is of very much more value than when spread over several occasions in sums of £5, but that in the absence of the proposed authority for the expenditure of a sum not exceeding £50, such large sums could not be given when applications were suddenly received from several ladies at the same time.

(5) It was proposed by Major-Gen. Sir H. R. Whitehead that Major-Gen. Sir G. B. Stanistreet be elected a member of the Committee vice Sir David Bruce, and that the Vice-Presidents and remainder of the Committee be re-elected. This proposal was seconded by Col. Pilcher and carried unanimously.

(6) It was proposed and carried that the present Auditors, Messrs. Evans and Peirson, be re-elected.

(7) Lieut.-Col E. M. Wilson was re-elected as Secretary for one year.

(8) It was proposed by Lieut.-Col. A. B. Cottell that the Royal Army Medical Corps Officers' Benevolent Society be wound up, and its Funds and functions taken over by the Royal Army Medical Corps Fund.

In this connexion Col. Cottell said that the original purpose of the Fund was to assist children of Officers who became orphans, but that he thought there was a tendency for these children to become pensioners in time. Several officers disagreed with this view.

Col. Cottell thought that if the two Funds were amalgamated, this step would meet with the approval of most officers, and most of them would be more willing to join one Fund than two.

In reply to this it was pointed out by one member that the subscription might be reduced from two guineas to £1.

The Chairman asked how the legal situation stands.

The Secretary stated that the matter had been gone into before and legal advice taken. He continued: "It was decided that the Secretaryships could be combined; but the executors and bankers said that the two Funds must be kept separate; to join them together would involve electing new Trustees."

Capt. Clapham pointed out that this step would probably bring the Fund under the operation of the Friendly Society's Act, which would result in many and various complications.

After further discussion the Secretary was instructed to obtain all necessary information and bring it forward at the next meeting.

E. M. Wilson,
Lieut.-Col. Secretary.

ROYAL ARMY MEDICAL CORPS OFFICERS' BENEVOLENT SOCIETY.

Proceedings of a Committee Meeting held at the War Office, Whitehall, on June 21, 1920.

Present.

Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., Director-General, in the chair.

Major-Gen. Sir W. Donovan, K.C.B.

Major-Gen. Sir G. B. Stanistreet, K.B.E., C.B., C.M.G.

Col. A. Peterkin, C.B.

Capt. J. T. Clapham.

(1) Letters of regret for absence were read from Col. H. W. Murray and Lieut.-Col. A. B. Cottell.

(2) The minutes of the meeting held on April 14, 1920, were read and confirmed.

(3) The Secretary read the Report of the Proceedings of the Annual General Meeting held on June 14, 1920.

(4) With reference to para. 3 of the Report relating to the distribution of the grants to orphans which had been recommended by the Committee, it was noted that the Annual General Meeting had decided that "these grants should be passed as they stand, and that the Secretary was directed to report to the Committee any cases in which they could be reduced without hardship."

The Secretary then submitted the details of several cases including some in which he had been directed by the Committee at its meeting in April to make further inquiries. The replies which have now been received were considered and grants authorized. Four new cases which have come in recently were also considered and grants authorized in three instances; the fourth was refused.

The particulars of the cases are set out *below*, the recipients being distinguished by the initials of the father. The total number of applications was thirty-nine, representing sixty-nine orphans, and the total grants amounted to £1,415. This is the largest distribution ever made since the foundation of the Society.

(6) Para. 8 of the Report of the Annual General Meeting was next considered, in which Lieut.-Col. A. B. Cottell had suggested "that the Royal Army Medical Corps Benevolent Society be wound up and its Funds and functions taken over by the Royal Army Medical Corps Fund."

It was noted that after discussion the Secretary has been instructed to obtain all necessary information and bring it forward at the next Committee Meeting.

The Secretary then read a précis of the proceedings of various meetings of the Committee, and also of the Committee of the Royal Army Medical Corps Fund when the matter was under consideration in 1905 and 1906, the net result being that the two Funds remained separate, but that a joint Secretary was appointed from January 1, 1907.

Also (2) Counsel's opinion, which had been obtained in March, 1905, which laid down that no action could be taken without application to the Charity Commissioners to obtain a fresh scheme which might have to be submitted to the Court of Chancery.

And (3) A personal letter which had just been received dated June 19, 1920, from Sir James

McGrigor, the senior Trustee of the Funds of the Society, in which he stated, "No doubt it might be feasible to effect this as suggested in Mr. Routh's opinion (the Counsel referred to above), but even the least expensive channel would entail considerable expense, and I do not see any commensurate gain to be derived."

Sir James McGrigor's personal opinion was decidedly against the proposal.

(6) The question was fully discussed, and it was decided in view of the legal opinion already recorded in 1905, and of the strong opinion expressed by Sir J. McGrigor on the subject, the Committee is unanimously averse to making any change in the constitution of the Fund.

(7) The Secretary reported four small grants made in urgent cases under Rule 31 since the last meeting on April 14, 1920. These were approved and are included in the total grants on attached table.

(8) The following subscriptions and donations received since the last Committee meeting were reported.

	£	s.	d.
*Dartford War Hospital (Col. Bond)	70	0	0
*49th General Hospital	27	12	9
*28th General Hospital	12	10	9
*Medical Units per U.S. Trustee	48	8	7
Stewart Macfarlan Trust	37	10	0
*From Auxiliary per U.S. Trustee	40	4	6
*17th Division Entertainment Committee	140	10	0
	£376	16	7

Proportion allotted to this Fund of larger cheques received, the balances of which have been allotted by the donors to other Funds.

(9) It was noted that the present number of new subscribers who have joined as a result of the appeal issued on the occasion of the centenary is 140.

STATEMENT OF GRANTS TO ORPHANS FOR THE YEAR 1920.

These grants were authorized by the Annual General Meeting held on June 14, 1920, power being given to the Committee to modify the amounts in certain cases where considered advisable.

	£	s.	d.
The orphan of E. W. B.	£40	0	0
The orphan of T. B...	50	0	0
Two orphans of K. M. C.	30	0	0
The orphan of J. W. C.	45	0	0
The orphan of W. J. C.	20	0	0
Three orphans of G. C.	50	0	0
The orphan of R. A. C.	50	0	0
The orphans of W. C.	35	0	0
Two orphans of C. W. D.	20	0	0
Two orphans of J. F.	50	0	0
The orphan of J. R. F.	50	0	0
Two orphans of E. M. G.	40	0	0
The orphan of R. G. H.	20	0	0
Three orphans of W. T. H.	50	0	0
Four orphans of W. S. H.	40	0	0
The orphan of W. H.	40	0	0
Seven orphans of W. H.	60	0	0
The orphan of C. J. H.	40	0	0
The orphan of W. F. T. I.	60	0	0
Two orphans of T. L. J.	40	0	0
The orphan of J. McC.	30	0	0
Three orphans of T. McC.	50	0	0
Two orphans of R. D. O'C. ..	40	0	0
The orphan of J. O.	50	0	0
The orphan of W. T. O.	25	0	0
Two orphans of F. M. M. O. ..	50	0	0
The orphan of C. Q.	40	0	0
The orphan of A. S.	20	0	0
The orphan of B. C. S.	30	0	0
Two orphans of V. H. S.	40	0	0
The orphan of H. H. S.	20	0	0
Two orphans of R. C. T.	20	0	0
Two orphans of H. C. T.	30	0	0
The orphan of A. T.	20	0	0
Seven orphans of J. W.	60	0	0
Two orphans of A. W.	60	0	0
Sixty-eight orphans received £1,415	£1,415	0	0

STATEMENT OF ACCOUNT OF THE ROYAL ARMY MEDICAL CORPS OFFICERS' BENEVOLENT SOCIETY FOR THE YEAR ENDING DECEMBER 31, 1919.

Receipts.				£	s.	d.
To Balance at Bank, January 1, 1919				289	10	3
,, Subscriptions				425	7	6
,, Donations—						
Mrs. A. W. Hooper	£12	2	0			
Major J. B. Riddick	5	0	0			
45th Indian General Hospital by Lieut.-Col. D. Renton	20	10	0			
Rouen Medical Society	10	17	8			
3rd P.O.W. Committee by Lieut. Streeter	1	18	7			
Mrs. MacBean and Miss Allan	5	0	0			
R.A.M.C. Depot, Deolali, India	25	0	0			
Brig.-Gen. M. H. G. Fell, C.B.	150	0	0			
No. 4 Casualty Clearing Station, Non-commissioned Officers and men	40	1	6			
Capt. C. Greenhough	3	0	0			
Sir James Galloway	3	3	0			
Secretary 84th General Hospital, Officers' Mess, East Africa	63	15	5			
No. 4 Stationary Hospital	56	5	0			
No. 53 Stationary Hospital, Archangel	20	0	0			
				416	13	2
,, Dividends—						
North Eastern Railway 3 % Debenture Stock, *less* tax				139	19	8
London and North Western Railway 3 % Debenture Stock, *less* tax				140	0	2
Midland Railway 2½ % Debenture Stock, *less* tax				112	0	0
Caledonian Railway 4 % Debenture Stock, *less* tax				77	16	10
Consols, *less* tax				23	4	8
War Stock 5 %				26	2	8
War Bonds 5 %				5	0	0
,, Refund of Income Tax, 1918				202	2	5
,, Donations given in error transferred to R.A.M.C. Fund				15	6	6
				£1,873	3	10

Expenditure.	£	s.	d.
By Grants	1,300	0	0
,, Office Expenses, 1918	71	7	3
,, Printing Book of the Rules and List of Subscribers	11	0	0
,, Bankers' Charges and two Cheque Books	0	17	3
,, Auditors Fee, 1918	1	1	0
,, Donation given in error transferred to R.A.M.C. Fund	15	6	6
,, Donation given in error transferred to General Relief Fund	40	1	6
,, Half of Donation from 84th General Hospital transferred to Auxiliary	31	0	0
,, Special Advertisement in *Times* in connexion with above	1	12	0
,, Parts of Donations from No. 4 and No. 53 Stationary Hospital transferred to General Relief Branch	37	10	0
,, Parts of Donations from No. 4 and No. 53 Stationary Hospital transferred to Auxiliary	28	0	0
,, Subscriptions accredited in error	1	1	0
	1,538	16	6
,, Balance Credit	334	7	4
	£1,873	3	10

Investments at Cost.	£	s.	d.
London & North Western Railway 3 % Debenture Stock	6,667	0	0
North Eastern Railway 3 % Debenture Stock	6,666	0	0
Midland Railway 2½ % Debenture Stock	6,400	0	0
Caledonian Railway 4 % Debenture Stock	2,780	0	0
Consols	1,327	7	9
War Stock 5 % 1929/47	450	0	0
National War Bonds 5 % 1928	200	0	0

We have compared the above statement with the books and vouchers relating thereto, and certify it to be correct. We have verified the Bank Balance and the Investments.

Portland House,
Basinghall Street, London, E.C. 2,
March 19, 1920.

(*Signed*) EVANS, PEIRSON & CO.,
Chartered Accountants.

ROYAL ARMY MEDICAL COLLEGE.

LIST OF BOOKS ADDED TO THE LIBRARY DURING THE MONTHS OF APRIL, MAY AND JUNE, 1920.●

Title of Work and Author	Edition	Date	How obtained
The Simple Carbohydrates and the Glucosides. By E. F. Armstrong, D.Sc., Ph.D.	3rd	1919	Library Grant.
An Introduction to the History of Medicine. By Fielding H. Garrison, A.B., M.D.	2nd	1917	,, ,,
Housing and the Public Health. By John Robertson, C.M.G., O.B.E., M.D,		1919	,, ,,
Contributions to Medical and Biological Research. Dedicated to Sir William Osler, Bart., M.D., F.R.S., in honour of his 70th Birthday, July 12, 1919. By his Pupils and Co-Workers. 2 vols.		1919	,, ,,
Handbook of Sanitary Law. By B. Burnett Ham, M.D., D.P.H. Edited by H. R. Kenwood, C.M.G., F.R.S.	8th	1920	,, ,,
Swanzy's Handbook of Diseases of the Eye. Edited by Louis Werner, M.B.	12th	1919	,, ,,
Diseases of the Nose and Throat. By Hubert Tilley, B.S., F.R.C.S.	4th	1919	,, ,,
Principles of Human Physiology. By E. H. Starling, C.M.G., F.R.S.	3rd	1920	,, ,,
A Treatise on Regional Surgery. By Various Authors. Edited by John F. Binnie, A.M., C.M., F.R.C.S. 3 vols.		1919	,, ,,
A Text-Book of Mycology and Plant Pathology. By John W. Harshberger, Ph.D.		1918	,, ,,
A Laboratory Course in Serum Study. By Zinsser, Hopkins and Ottenberg		1916	,, ,,
Fractures, Compound Fractures, Dislocations and their Treatment. With a Section on Amputations and Artificial Limbs. By John A. C. Macewan, M.B., C.M.		1919	,, ,,
An Atlas of the Primary and Cutaneous Lesions of Acquired Syphilis in the Male. By Major C. F. White, O.B.E., R.A.M.C., and Capt. W. H. Brown, M.D., R.A.M.C. (T.F.) Hand Stereoscope No. 2 for use with this book.		1920	,, ,,
Food Poisoning and Food Infections. By W. G. Savage, B.Sc.		1920	,, ,,
The New Physiology in Surgical and General Practice. By A. Rendle Short, M.D.	4th	1920	,, ,,
Chlorination of Water. By Joseph Race, F.I.C... ..		1918	,, ,,
The Diagnosis and Treatment of Nervous Diseases. By Sir James Purves Stewart, K.C.M.G.	5th	1920	,, ,,
A Study of Splashes. By A. M. Worthington, L.B., F.R.S.		1908	,, ,,
The Essentials of Chemical Physiology. By W. D. Halliburton, M.D., F.R.S.	10th	1919	,, ,,
The Physiology of Muscular Exercise. By F. A. Bainbridge, M.A., M.D., F.R.S.		1919	,, ,,
The Nursery School. By Margaret McMillan		1919	,, ,,
Aids to the Mathematics of Hygiene. By R. Bruce Ferguson, M.A., M.D.	5th	1919	,, ,,
An Introduction to the Theory of Statistics. By G. Udney Yule, C.B.E., M.D.	5th	1919	,, ,,
A Manual of Physics. By J. A. Crowther, Sc.D... ..		1919	,, ,,
Cunningham's Manual of Practical Anatomy. Vol. i. Edited by A. Robinson	7th	1919	,, ,,
Studies in Malaria. By Capt. Hugh Stott, I.M.S. ..		1916	,, ,,

LIST OF BOOKS ADDED TO THE LIBRARY—*Continued.*

Title of Work and Author	Edition	Date	How obtained
Field Service Sanitary Notes, India		1919	Library Grant.
Toxines et Antitoxines. Par Nicolle, Casari and Jouan ..		1919	,, ,,
Everyday Chemistry. By W. Robinson, B.Sc.		1920	,, ,,
The Diagnostics and Treatment of Tropical Diseases. By E. R. Stitt, M.D.	3rd	1919	,, ,,
Surgical Therapeutics and Operative Technique. By E. Doyen. English Edition. Vol. iii. Prepared by the author in collaboration with H. Spencer Browne, M.B.		1920	,, ,,
Electrical Treatment. By Wilfred Harris, M.D. ..	3rd	1919	Editor, Journal.
An Introduction to General Physiology, with Practical Exercises. By W. M. Bayliss, M.A., D.Sc., F.R.S.		1919	,, ,,
Backwaters of Lethe. By G. A. H. Barton, M.D. ..		1920	,, ,,
Malay Poisons and Charm Cures. By John D. Gimlette		1915	,, ,,
The Industrial Clinic : A Handbook dealing with Health in Work. By Several Writers. Edited by Edgar L. Collis, M.D.		1920	,, ,,
Practical Tropical Sanitation. By E. P. Minett, M.D...		1920	,, ,,
Military Psychiatry in Peace and War. By E. Stanford Read, M.D.		1920	,, ,,
The Systematic Treatment of Gonorrhœa in the Male. By Norman Lumb, O.B.E.	2nd	1920	,, ,,
The Radiography of the Chest. Vol. i. Pulmonary Tuberculosis. By Walker Overend, M.A., M.D.		1920	,, ,,
Diathermy in Medical and Surgical Practice. By Claude Sabertan, M.D.		1920	,, ,,
Description of the Johns Hopkins Hospital. By John S. Billings, M.D.		1890	War Office
History of the Medical School in Trinity College, Dublin. By T. P. C. Kirkpatrick		1912	,, ,,
Biological Treatment of Sewage (Pamphlet). By W. C. Tyndale, M.I.C.E.		1899	,, ,,
Cholera, Dysentery and Fever: The Nature, Causes, Connection and Treatment. By Charles Searle, M.D.		1847	,, ,,
First and Second Reports of the Committee appointed to inquire into the Effect on Health of the Present System of Carrying the Accoutrements, Ammunition and Kit of Infantry Soldiers, and Drill, etc., of Recruits		1865-1867	,, ,,
Yellow Fever. Abstracts from Half-yearly and Annual Reports, Jamaica, Bahamas, Bermuda and Honduras. Manuscript		1817	,, ,,
Ditto. Ditto. Barbados, St. Kitts, Antigua, St. Lucia, Demerara, St. Vincent, Berbice, Tobago, Dominica, Trinidad, Grenada and Montserrat. Manuscript		1819	,, ,,
Returns and Reports on Delirium Tremens, Gibraltar, Malta, Ionian Islands, West Indies, Jamaica, Bahamas, Bermuda and West Africa. Manuscript		1841	,, ,,
Ditto Ditto Nova Scotia .. New Brunswick and Newfoundland. Manuscript ..		1842	,, ,,
Ditto Ditto Cape of Good Hope .. Mauritius, Ceylon, Bengal, Madras and Bombay		1841	,, ,,
Reports of the Chemical Analysers to Government, Bombay and Sind		1918	India Office
Annual Report on Civil Hospitals and Dispensaries, Bombay		1918	,, ,,
Report on the Working of Hospitals and Dispensaries under the Government of Bengal		1918	,, ,,
Notes on Vaccination in the Bombay Presidency for the year 1918-19. With Appendices		1919	,, ,,
Annual Report of the Chemical Examiner to the Government of the United Provinces of Agra and Oudh, and of the Central Provinces		1919	,, ,,

LIST OF BOOKS ADDED TO THE LIBRARY—*Continued.*

Title of Work and Author	Edition	Date	How obtained
Triennial Report on the Lunatic Asylums in Bengal for the years 1915, 1916 and 1917. By Surg.-Gen. W. H. B. Robinson, C.B., I.M.S.		1918	India Office.
Annual Returns of the Lunatic Asylums in Bengal, with Brief Notes for the Year 1918. By the Hon. Col. J. K. Close, M.D., I.M.S.		1919	,, ,,
Triennial Report of the Lunatic Asylums in the Central Provinces for the years 1915, 1916 and 1917		1918	,, ,,
Notes on Hospitals and Dispensaries in the Central Provinces and Berar :—			
For the period ending December 31, 1917		1918	,, ,,
For the period ending December 31, 1918		1919	,, ,,
Annual Sanitary Report of the Central Provinces and Berar :—			
For the year 1917		1918	,, ,,
For the year 1918		1919	,, ,,
Notes on Vaccination in the Central Provinces and Berar :—			
For the year 1917-18		1918	,, ,,
For the year 1918-19		1919	,, ,,
Annual Report of the Chemical Examiners Department for 1918. Calcutta		1919	,, ,,
Annual Report of the Chemical Examiner to the Government of the United Provinces of Agra and Oudh and of the Central Provinces for the year 1918		1919	,, ,,
Annual Report of the Civil Hospitals and Dispensaries of the United Provinces		1917	,, ,,
Ditto Ditto		1918	,, ,,
Notes on Vaccination in the United Provinces of Agra and Oudh		1918	,, ,,
Ditto Ditto		1919	,, ,,
Fiftieth Annual Report of the Sanitary Commissioner of the United Provinces of Agra and Oudh		1917	,, ,,
Fifty-first Annual Report of the Sanitary Commissioner of the United Provinces of Agra and Oudh		1918	,, ,,
Report on the Working of the Micro-Biological Section of the King Institute of Preventive Medicine, Guindy, for the year 1919. (With Appendices)		1920	,, ,,
Report on the Statistical Returns of the Provincial Lunatic Asylum in Assam for the year 1919		1920	,, ,,
Triennial Report on the Working of the Patna Lunatic Asylum in Bihar and Orissa, for the years 1915, 1916 and 1917		1918	,, ,,
Annual Returns of the Lunatic Asylums in Bihar and Orissa		1918	,, ,,
Annual Sanitary Report of the Province of Bihar and Orissa		1917	,, ,,
Annual Returns of the Hospitals and Dispensaries in Bihar and Orissa		1917	,, ,,
Ditto Ditto		1918	,, ,,
Annual Statistical Returns and Short Notes on Vaccination in Bihar and Orissa		1917-18	,, ,,
Ditto Ditto		1918 19	,, ,,
The Japan Medical World, February 1 to May 28.. ..		1920	The Director.
Journal of the Royal Naval Medical Service. Vol. vi. No. 2, April		1920	The Editor.
The *Medical Officer*, April 3 to June 26		1920	,, ,,
Year Book of the Royal Society of London		1920	The Royal Society.

LIST OF BOOKS ADDED TO THE LIBRARY—*Continued.*

Title of Work and Author	Edition	Date	How obtained
The *Kitasato Archives of Experimental Medicine.* Vol. iii. No. 3, December		1919	The Director.
The *Geographical Journal*, April, May and June		1920	Presented by Col. R. J. S. Simpson, C.B., C.M.G.
Man: a Monthly Record of Anthropological Science, April, May and June		1920	Presented by Col. S. L. Cummins, C.B., C.M.G.
Processus Integri in Morbis Feré Omnibus Curandis. A. Thoma Sydenham, M.D., Edinburgi		1750	Presented by Col. C. H. Melville, C.M.G.
Notes and Recollections of a Professional Life. By the late William Fergusson, M.D., Inspector General of Military Hospitals. Edited by his son, James Fergusson		1846	Presented by Lieut.-Gen. Sir A. Codrington, K.C.V.O., C.B.
Contributions to Military and State Medicine. By John Martin, Surgeon, A.M.S		1881	,, ,,
The Life of Pasteur. By René Vallery-Radot. Translated by Mrs. R. L. Downshire, 2 vols		1911	Presented by Sir A. Frederick Bradshaw, K.C.B.
Wellcome Bureau of Scientific Research, War against Tropical Disease. By Andrew Balfour, C.B., C.M.G., M.D., etc.		1920	Presented by the Author.
Condensed Milk. By Dr. P. Lassablière		1919	,, ,,
Ministry of the Interior, Egypt. Department of Public Health. Reports and Notes of the Public Health Laboratories, Cairo		1919	The Director, Public Health Laboratories.
Medical Research Committee. Reports of the Chemical Warfare Committee, No. 20. Pulmonary Lesions caused by Chloropicrin in Goats		1920	Medical Research Committee.
Special Report Series, No. 50. Cerebrospinal Fever. Studies in the Bacteriology, etc., among the Military Forces, 1915-19		1920	,, ,,

BIRTH.

SCOTT.—On July 11, at 5, Marion Crescent, Selkirk, the wife of Major T. H. Scott, D.S.O., M.C., Royal Army Medical Corps—a son.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

Major, arrived Egypt December, 1919, for tour, is willing to exchange to go to India coming trooping season; consideration required. Apply E., c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C. 2.

Senior Major, R.A.M.C., serving Egypt, tour expires in December, 1921, desires early exchange with officer serving England, low down in roster. Reply stating terms to D.C., c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C. 2.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels and Proceedings of the United Services Medical Society.

Any demand for reprints, additional to the above, or for excerpts, must be forwarded at the time of submission of the article for publication, and will be charged for at the following rates, and additional copies at proportionate rates:—

Number of Reprints	Number of Pages	Cost of Reprints	Cost of Excerpts*	Extra for Covers for Reprints: As Journal, Printed on Front	As Journal, Plain, Unprinted	Cheaper Paper, Printed on Front	Cheaper Paper, Plain, Unprinted
		£ s. d.	£ s. d.	s. d.	s. d.	s. d.	s. d.
12	4	0 5 6	0 2 6	8 6	2 3	7 0	1 6
	8	0 10 0	0 5 0				
	16	0 16 6	0 8 6				
25	4	0 6 9	0 3 0	9 9	3 0	8 9	2 0
	8	0 12 0	0 5 9				
	16	1 1 0	0 10 6				
50	4	0 9 0	0 4 0	12 0	4 3	10 0	2 6
	8	0 15 0	0 7 0				
	16	1 6 6	0 12 6				
100	4	0 12 0	0 6 3	16 0	8 0	14 0	5 0
	8	1 0 0	0 10 0				
	16	1 17 0	0 15 6				
200	4	0 19 0	0 9 0	1 2 0	15 0	18 0	10 0
	8	1 10 0	0 14 0				
	16	2 12 0	0 18 0				

* These are not arranged as Reprints, but appear precisely as in the Journal with any other matter that may happen to appear on the first and last pages of the particular excerpt ordered.

Cases for Binding Volumes.—Strong and useful cases for binding can be obtained from the publishers at the undermentioned rates:—

Covers, 3s. 9d. net; binding, 3s. 9d.
These charges are exclusive of cost of postage.

In forwarding parts for binding the name and address of sender should be enclosed in parcel.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 56, Cornwall House, Stamford Street, S.E. 1.

Communications have been received from the following: Cols. Sir Robert Firth, K.B.E., C.B., G. St. C. Thom, D. Harvey; Lieut.-Col. D. O. Hyde; Majors J. E. Boyd, A. C. Amy, W. R. O'Farrell, H. J. M. Perry; Andrew Balfour, Esq., C.B., C.M.G.

The following publications have been received:—

British: The Hospital, The Medical Press and Circular, The Medical Journal of Australia, The Medical Journal of South Africa, Commonwealth of Australia Quarantine Service, The Journal of Tropical Medicine and Hygiene, The Journal of State Medicine, Guy's Hospital Gazette, Agricultural Research Institute (Pusa), Seale Hayne Neurological Studies, The Clinical Journal, The Indian Journal of Medical Research, The British Journal af Tuberculosis, Tropical Veterinary Bulletin, The Journal of the Royal Army Service Corps, Journal of the Royal Naval Medical Service.

Foreign: Abstract of Bacteriology, Le Bulletin Médical, Archives de Médecine et de Pharmacie Navales, L'Ospedale Maggiore, Bulletin de la Société de Pathologie Exotique, United States Public Health Services, Archiv für Schiffs- und Tropen-Hygiene, Pathologie und Therapie exotischer Krankheiten, Bulletin of the Johns Hopkins Hospital, Le Caducée, Surgery, Gynæcology and Obstetrics, Giornale di Medicina Militare, Bulletin de l'Institut Pasteur, Medicina Militar.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, six months constituting one volume, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. Subscriptions should commence from 1st July each year; but if intending subscribers wish to commence from any other month, they may do so by paying for the odd months at the rate of 2d. per copy. (All subscriptions are payable in advance.)

Officers of the Royal Army Medical Corps possessing Diplomas in Public Health, etc., are kindly requested to register their special qualifications at the War Office. Letters of complaint are frequently received from officers stating that their special qualifications have not been shown in the Distribution List which is published as a supplement to the Journal in April and October of each year. As, however, the particulars of this list are supplied from official sources, officers are reminded that unless the possession of Diplomas, etc., has been registered at the War Office, no entry of such qualifications can be recorded in the Distribution List.

Letters notifying change of address should be sent to the Hon. Manager, "Journal of the Royal Army Medical Corps," Cornwall House, Stamford Street, S.E. 1, and must reach there not later than the 20th of each month for the alteration to be made for the following month's issue.

It is requested that all Cheques or Postal Orders for Subscriptions to the Journal, Corps News, Reprints, etc., be crossed "Holt & Co.," and made payable to the "Hon. Manager, Journal R.A.M.C.," and not to any individual personally.

All communications for the Hon. Manager regarding subscriptions, etc., should be addressed to

THE HON. MANAGER,
"JOURNAL OF THE ROYAL ARMY MEDICAL CORPS,"
CORNWALL HOUSE, STAMFORD STREET, S.E.1.

JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

September, 1920.

EXTRACTS FROM "THE LONDON GAZETTE."

War Office,
June 1, 1920.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign.

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

Decoration conferred by His Majesty the King of the Belgians.

Médaille du Roi Albert.

Col. George Abraham Moore, C.M.G., D.S.O., M.D.

Decorations conferred by the President of the French Republic.

Médaille d'Honneur avec glaives "en vermeil."

Qmr. and Capt. John Denison Chapman, O.B.E., T.D., Royal Army Medical Corps (Territorial Force).

Col. Arthur D. Ducat, D.S.O., M.B., T.D., Army Medical Service (Territorial Force).

Qmr. and Capt. William Thyne Liddell, Royal Army Medical Corps (Territorial Force).

Capt. Matthew Wallace Paterson, O.B.E., M.C., Royal Army Medical Corps (Special Reserve).

Capt. Richard Payne Pollard, M.C., M.B., Royal Army Medical Corps (Territorial Force).

Capt. David Jobson Scott, O.B.E., M.C., M.D., Royal Army Medical Corps (Territorial Force).

Médaille d'Honneur avec glaives "en bronze."

512221 Pte. Edward Michael Francis Canham, 2/3rd (London) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Islington, N.).

316105 Serjt. John Dewar, 1/2nd (Lowland) Field Ambulance, Royal Army Medical Corps (Territorial Force) (E) (Glasgow).

80671 Cpl. Frederick Thomas John Hudson, 1/2nd (Lowland) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Bicester).

318033 Serjt. John Johnston, 1/2nd (Lowland) Field Ambulance, Royal Army Medical Corps (Territorial Force) (E) (Glasgow).

318004 Serjt.-Major William Millar, 1/2nd (Lowland) Field Ambulance, Royal Army Medical Corps (Territorial Force (E) (Glasgow).

512509 Pte. Alfred Smith, 2/3rd (London) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Walthamstow).

318034 Serjt. Robert Stevenson, 1/2nd (Lowland) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Glasgow).

12619 Pte. (Acting Lance-Cpl.) Ernest Thomas, 1/2nd (Lowland) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Southall).

339296 Serjt. Harold Watson, 2nd (West Lancashire) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Liverpool).

Médaille des Epidémies "en argent."

Temp. Capt. (Acting Major) James Robertson Anderson, M.B., Royal Army Medical Corps.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF ROUMANIA.

Order of the Star of Roumania (with swords).

Chevalier.—Capt. Duncan Campbell Lloyd Fitzwilliams, C.M.G., M.D., F.R.C.S., Royal Army Medical Corps (Territorial Force).

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W. 1.
June 5, 1920.

The King has been graciously pleased, on the occasion of His Majesty's Birthday, to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire :—

To be Knight Commander of the Civil Division of the said Most Excellent Order :—

Col. William Taylor, C.B., M.D., A.M.S., Ex-President of Royal College of Surgeons in Ireland.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W. 1,
June 10, 1920.

The King has been graciously pleased to give orders for the following appointment to the Most Excellent Order of the British Empire, in recognition of valuable services rendered in connection with the war. To be dated June 3, 1919, unless otherwise stated :—

To be Commander of the Military Division of the said Most Excellent Order :—

Temp. Lieut.-Col. Ernest William White, M.B., Royal Army Medical Corps. (Substituted for the notification published in *London Gazette*, dated June 3, 1919.)

War Office,
June 10, 1920,

His Majesty the King has been graciously pleased to approve of the undermentioned reward in recognition of gallant and distinguished service in the field, which had been brought to notice in accordance with the terms of Army Order 193 of 1919. To be dated May 5, 1919, unless otherwise stated :—

AWARDED THE DISTINGUISHED CONDUCT MEDAL.

19651 Cpl. A. C. Jebbitt, Royal Army Medical Corps (Aldershot).

War Office,
June 10, 1920.

The name of the undermentioned officer is to be added to those brought to the notice of the Secretary of State for War in accordance with the terms of Army Order 193 of 1919 for valuable services rendered whilst prisoners of war or interned. (Published in the Supplement to the *London Gazette*, dated January 30, 1920, No. 31759 (pages 1227-8)) :—

Temp. Capt. J. G. M. Malony, Royal Army Medical Corps.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W. 1,
June 10, 1920.

ORDER OF THE BRITISH EMPIRE.

Amendments.

The following amendments to the lists of appointments to the Most Excellent Order of the British Empire announced in the *London Gazette* on the dates stated are notified :—

Corrections to name : *London Gazette*, dated December 12, 1919.—Page 15457. For Major George Watson Robertson, South African Medical Corps, read Capt. (Temp. Major) George Whiteside Robertson, Union Reserve of Officers (Medical), attached South African Medical Corps. Page 3999. For Lieut. Raymond Barnett, Royal Army Medical Corps, read Lieut. Raymond Theodore Frederick Barnett, Royal Army Medical Corps (Territorial Force).

Corrections to rank : *London Gazette*, dated November 18, 1918.—Page 13578. For Temp. Capt. Donald McIntyre, Royal Army Medical Corps, read Capt. Donald McIntyre, M.B., Royal Army Medical Corps (Special Reserve). (This amendment also applies to *London Gazette*, dated April 15, 1919).

War Office,
June 10, 1920.

Correction : *London Gazette*, No. 31759, dated January 30, 1920. Page 1228 : Mention.—For 46756 Pte. F. J. Gardiner, Royal Army Medical Corps, read 46756 Pte. F. Gardner, Royal Army Medical Corps.

ARMY MEDICAL SERVICE.

Major-Gen. Louis E. Anderson, C.B., retires on retired pay, dated May 4, 1920.

Col. Lancelot P. More, M.B., is placed on half pay, dated March 2, 1920. (Substituted for the notification in the *Gazette* of April 7, 1920.)

Col. Robert J. Blackham, C.B., C.M.G., C.I.E., D.S.O., M.D., F.R.F.P.S., is placed on half pay, dated May 18, 1920.

Major-Gen. Stuart Macdonald, C.B., C.M.G., M.B., K.H.P., retires on retired pay, dated June 18, 1920.

Col. (Temp. Brig.-Gen.) W. W. O. Beveridge, C.B., C.B.E., D.S.O., M.B., Army Medical Service, is appointed Hon. Physician to the King, vice Major-Gen. S. Macdonald, C.B., C.M.G., retired pay, dated June 18, 1920.

ROYAL ARMY MEDICAL CORPS.

Lieut.-Col. Arthur M. MacLaughlin, C.B.E., M.B., relinquishes the acting rank of Colonel, dated March 31, 1920.

Lieut.-Col. Ernest E. Ellery retires on retired pay, dated August 7, 1920.

Temp. Lieut. John Francis Patrick Gallagher to be Lieutenant, dated November 8, 1919, but not to reckon for pay or allowances prior to June 1, 1920, with precedence next below W. Y. Eccott.

Major and Brevet Lieut.-Col. William F. Ellis, O.B.E., relinquishes the acting rank of Lieutenant-Colonel, dated April 25, 1919.

Major and Brevet Lieut.-Col. Ralph B. Ainsworth, D.S.O., Royal Army Medical Corps, to be a Temp. Asst. Director-General, vice Major (Temp. Lieut.-Col.) A. B. Smallman, C.B.E., D.S.O., M.D., Royal Army Medical Corps, dated June 1, 1920.

Major and Brevet Lieut.-Col. (Temp. Lieutenant-Colonel) Ralph B. Ainsworth, D.S.O., Royal Army Medical Corps, to be Temp. Asst. Director-General, and to retain his Temp. rank, vice Major (Temp. Lieut.-Col.) A. B. Smallman, C.B.E., D.S.O., M.D., Royal Army Medical Corps, dated June 1, 1920. (Substituted for the notification in the *Gazette* of June 16, 1920.)

Major Philip J. Marett to be Temporary Lieutenant-Colonel while specially employed, dated March 19, 1920.

Major Reginald V. Cowey, D.S.O., to be acting Lieutenant-Colonel, dated March 29, 1920.

Major Horace G. Pinches relinquishes the Temporary rank of Lieutenant-Colonel, dated April 29, 1920.

Major James S. Dunne, D.S.O., F.R.C.S.I., to be acting Lieutenant-Colonel, dated May 20, 1920.

Major Arthur B. Smallman, C.B.E., D.S.O., M.D., relinquishes the temporary rank of Lieutenant-Colonel, dated June 1, 1920.

Major Arthur B. Smallman, C.B.E., D.S.O., M.D., is seconded for service under the Ministry of Health, dated June 1, 1920.

Major Walter F. H. Vaughan is placed temporarily on half pay on account of ill-health contracted on active service, dated July 9, 1920.

Major Robert R. Lewis relinquishes the temporary rank of Lieutenant-Colonel, dated July 27, 1916.

The date on which Temp. Major William T. F. Davies, C.M.G., D.S.O., M.D., relinquished his commission is April 17, 1919, and not as in the *Gazette* of May 31, 1920

Temp. Major Reginald Worth, O.B.E., M.B., relinquishes his commisson on ceasing to serve with the Springeld War Hospital, dated July 2, 1920, and retains the rank of Major.

Temp. Major John P. Campbell, M.B., relinquishes his commission on July 7, 1920, and retains the rank of Major.

Hon. Capt. Charles Arundel Hutchinson, late Royal West Kent Regiment, to be Lieutenant, dated June 21, 1920, with precedence next below W. Y. Eccott. (Substituted for the notification in the *Gazette* of July 9, 1920.)

Capt. David Joseph Heritage Jones, from Special Reserve, to be Lieutenant and to be Temporary Captain, dated June 1, 1917, but not to reckon for pay or allowances prior to July 1, 1920, with precedence next below J. M. Morrison.

Capt. Reynold Robert Evans, M.B., from Special Reserve to be Lieutenant and to be Temporary Captain, dated August 30, 1917, but not to reckon for pay or allowances prior to July 1, 1920, with precedence next below J. C. Burns.

Capt. Donald William Morison Mackenzie, M.B., late Royal Army Medical Corps, Special Reserve, to be Lieutenant and to be Temporary Captain, dated June 12, 1918, but not to reckon for pay or allowances prior to June 21, 1920, with precedence next below V. J. Perez.

Capt. Walter Yardley Eccott, M.B., Special Reserve, to be Lieutenant and to be Temporary Captain, dated March 20, 1919, but not to reckon for pay or allowances prior to June 1, 1920, with precedence next below J. McP. Mackinnon.

Capt. Gerald J. Keane, D.S.O., M.B., retires, receiving a gratuity, dated March 31, 1919, and retains the rank of Major. (Substituted for the notification in the *Gazette* of March 16, 1920.)

Capt. Godfrey Kindersley Maurice, D.S.O., M.C., from Territorial Force, to be Captain, dated April 26, 1919, but not to reckon for pay or allowances prior to June 23, 1920, with precedence next below W. W. S. Sharpe.

Capt. Hugh G. Trayer, M.B., resigns his commission, dated August 4, 1919, and is granted the rank of Major. (Substituted for the notification in the *Gazette* of July 29, 1919.)

Capt. John Francis William Meenan, from Special Reserve, to be Captain, dated October 14, 1919, but not to reckon for pay or allowances prior to July 1, 1920, with precedence next below J. A. Crawford.

Capt. James W. G. H. Riddel, M.C., M.B., resigns his commission, dated March 20, 1920, and is granted the rank of Major. (Substituted for the notification in the *Gazette* of March 19, 1920.)

Capt. James Y. Moore, O.B.E , retires, receiving a gratuity, dated April 9, 1920, and is granted the rank of Major. (Substituted for the notification in the *Gazette* of April 8, 1920.)

The notification in the *Gazette* of April 13, 1920, regarding Capt. Richard F. O'T. Dickinson, M.B., is cancelled.

Capt. Arthur N. R. McNeill, D.S.O., M.B., to be Temporary Major whilst specially employed, dated April 27, 1920.

Capt. Noel T. Whitehead, M.C., M.B., is seconded for service with the Egyptian Army, dated April 29, 1920.

Capt. Lionel B. Clarke, to be Acting Major, dated May 4, 1920.

Capt. Alexander M. Pollard, D.S.O., to be Temporary Major whilst specially employed, dated May 21, 1920.

Capt. Charles H. Brennan, M.C., resigns his commission, dated June 22, 1920.

The notification in the *Gazette* of June 24, 1920, regarding Capt. William L. M. Gabriel, M.B., is cancelled.

Capt. Cassidy de W. Gibb retires, receiving a gratuity, dated June 30, 1920, and is granted the rank of Major.

Temp. Capt. William H. Booth relinquishes his commission, dated July 3, 1920, and retains the rank of Captain.

Capt. Frederick Knowles Escritt, from Special Reserve, to be Lieutenant. and to be Temporary Captain, dated August 8, 1918, but not to reckon for pay or allowances prior to June 1, 1920, with precedence next below J. C. Coutts.

Temp. Capt. John Archer Cowan, M.B., to be Lieutenant and to be Temporary Captain, December 20, 1916, but not to reckon for pay or allowances prior to June 1, 1920, with precedence next below A. Rodd.

Temp. Capt. John Rollo Hayman, from Special Reserve, to be Captain, dated March 11, 1918, but not to reckon for pay or allowances prior to June 1, 1920, with precedence next below G. D. Harding.

The date on which Temp. Capt. James A. Giles, M.B., relinquished his commission is May 16, 1918, and not as in the *Gazette* of July 1, 1918.

The date on which Temp. Capt. Roderick J. Gordon, M.D., relinquished his commission is July 22, 1918, and not as in the *Gazette* of September 16, 1918.

Temp. Capt. Lawrence Handy to be Lieutenant and to be Temporary Captain, dated November 7, 1918, but not to reckon for pay or allowances prior to July 1, 1920, with precedence next below J. E. Rea.

Temp. Capt. Alexander Farquhar, M.B., relinquishes the acting rank of Major, dated April 4, 1919.

Temp. Capt. Alfred Cresswell Taylor to be Captain, dated May 6, 1919, but not to reckon for pay or allowances prior to June 1, 1920, with precedence next below W. D. Newland.

Temp. Capt. Adam Brown, O.B.E., M.B., relinquishes the acting rank of Lieutenant-Colonel, dated January 20, 1920.

The date on which Temp. Capt. William R. Reeds, M.B., relinquished his commission is April 30, 1920, and not as in the *Gazette* of April 9, 1920.

The notification in the *Gazette* of June 16, 1920, regarding Temp. Capt. Louis V. Gatt. M.D., is cancelled.

The date on which Temp. Capt. Bruce M. Carruthers, M.B., relinquished his commission is July 1, 1919, and not as in the *Gazette* of June 28, 1920.

Temp. Capt. Harold H. O'Hefferman relinquishes his commission, dated July 6, 1920, and is granted the rank of Major.

Temp. Capt. Charles E. Dolling, M.B., is removed from the Army, The King having no further occasion for his services as an officer, dated August 5, 1920.

The undermentioned Majors to be Acting Lieutenant-Colonels:—

Dated June 6, 1920.—Harry T. Wilson, D.S.O.

Dated June 8, 1920.—Rochford N. Hunt, D.S.O., M.B.

The undermentioned relinquish their commissions;—

Dated July 2, 1920.—Temp. Capt. Henry R. L. Joy, M.D., and is granted the rank of Major.

Dated July 18, 1920.—Temp. Lieut.-Col. Alfred Lingard, M.B., and retains the rank of Lieutenant-Colonel.

Temporary Captains and retain the rank of Captain:—

Dated April 13, 1920.—Samuel J. W. Donald, M.B.

Dated July 3, 1920.—Cornelius L. Driscoll.

Dated July 13, 1920.—William A. Hotson; Frederick H. Whyte, M.B.

Dated July 16, 1920.—Henry Stewart, M.B.

Dated July 20, 1920.—Henry H. Crickitt.

The undermentioned Captains retire, receiving a gratuity, and are granted the rank of Lieutenant-Colonel:—

Dated July 29, 1919.—Francis W. M. Cunningham, D.S.O., M.D.

Dated April 14, 1920.– Richard B. Phillips.

(Substituted for the notifications in the *Gazettes* of July 28, 1919, and April 13, 1920, respectively.)

The undermentioned Captains relinquish the acting rank of Major :—

Dated March 31, 1919.—Harold D. Lane, M.C.

Dated April 8, 1919.—Daniel McKelvey, M.C., M.D.

Dated April 20, 1919.—Robert A. Flood, M.C., M.B.

Dated August 22, 1919.—Noel T. Whitehead, M.C., M.B.

The undermentioned Majors retire on retired pay :—

Dated August 1, 1920.—George Baillie, M.B., on account of ill-health contracted on active service.

Dated August 5, 1920.—Richard N. Woodley, D.S.O.

The undermentioned Captains to be Majors :—

Dated August 1, 1920.—Brevet Major Charles Ryles, M.B. ; David S. Buist, M.B. ; Brevet Major William E. Marshall, M.C., M.B. ; Alexander M. Pollard, D.S.O. ; Gilbert. G. Collet, M.B. ; Colin Clarke, D.S.O., M.B., F.R.C.S. ; Temp. Major Edmund W. Vaughan, D.S.O., M.C., M.B. ; Arthur N. R. McNeill, D.S.O., M.B. ; Andrew R. Wright, D.S.O., M.B., and to be Brevet Lieutenant-Colonel, vide *Gazette* of December 12, 1919 ; Thomas B. Nicholls, M.B. ; Julian B. Jones, M.C., M.B. ; James A. Clarke, M.B. ; Stuart McK. Saunders ; Brevet Major Thomas J. Mitchell, D.S.O., M.B. ; Acting Major Donald H. C. MacArthur, O.B.E., M.D. ; Temp. Major George S. Parkinson, D.S.O. ; Herbert Gall ; Charles H. O'Rorke, M.B. ; John Startin, M.C. ; George H. Stack, M.B. ; Harold H. Leeson, M.C. ; Brevet Major Samuel W. Kyle, M.B. ; John W. Lane, M.D. ; Brevet Major William G. Wright, D.S.O. ; Brevet Major Albert T. J. McCreery, M.C., M.B.

The undermentioned Captains, from Special Reserve, to be Lieutenants, and to be Temporary Captains, but not to reckon for pay or allowances prior to June 1, 1920 :—

Dated January 20, 1917.—James Reay Sutherland Mackay, M.B., with precedence next below A. P. Draper.

Dated July 19, 1917.—William Irving Fitzgerald Powell, with precedence next below J. C. Collins.

Dated January 15, 1918.—Wilhelm Otto Holst, with precedence next below E. P. N. Creagh.

Dated April 8, 1918.—William Lawson Mabson Gabriel, M.B., with precedence next below C. P. Chambers.

The undermentioned to be Captains, but not to reckon for pay or allowances prior to June 1, 1920 :—

Captains from Special Reserve :—

Dated March 19, 1918.—Cyril Armstrong, M.B.E., M.B., with precedence next below L. J. Sheil ; John Wilson Cannon, M.B., with precedence next below E. E. Holden.

Dated April 7, 1918.—Norman Cameron, M.B., with precedence next below G. P. Kidd.

Dated January 1, 1920,--John Cullenan, M.B., with precedence next below T. S. Law.

Dated January 24, 1920.—Capt. John Bennet, M.B., with precedence next below W. J. F. Craig ; Roderick Duncan Cameron, M.C., M.B., with precedence next below G. B. Wild ; Douglas Horne Murray, M.B., with precedence next below R. S. Cumming.

Dated January 26, 1920.—John Archibald Nicholson, M.C., M.B., with precedence next below J. Bennett.

Dated March 4, 1920.—Alexander Keith Robb, M.B., with precedence next below A. H. Clarke.

Dated March 22, 1920.—John Armstrong Crozier Kidd, M.B., with precedence next below D. R. Hennessy.

Temp. Captains :—

Dated February 20, 1918.—Arthur Wesley Dennis, with precedence next below C. W. Sparks.

Dated September 9, 1918.—Hubert Lewis Clifford Noel, with precedence next below E. M. Townsend.

Dated December 1, 1918.—Patrick Gerald Tuohy, M.B., with precedence next below R. N. Porritt.

Dated February 2, 1919.—John Mandeville Macfie, M.C., M.B., with precedence next below R. A. Mansell.

Dated March 8, 1919.—Lionel Matthew Rowlette, D.S,O., M.C., with precedence next below R. F. Walker.

Dated April 28, 1919.—Donald John MacDougall, M.C., M.B., with precedence next below W. W. S. Sharpe.

Dated May 15, 1919.—George Fleming, M.B., with precedence next below C. L. Emmerson.

Dated August 16, 1919.—Henry Aloysius Boyle, M.B., with precedence next below T. E. B. Beatty.

Dated August 23, 1919.—Douglas Crellin, M.C., with precedence next below T. E. B. Beatty.

Dated September 14, 1919.—Robert William Chapman, M.B., with precedence next below A. A. B. Scott.

Dated January 18, 1920.—Granville Burnett Wild, with precedence next below G. Moulson.

The undermentioned to be Captains, but not to reckon for pay or allowances prior to June 1, 1920:—

Dated January 25, 1912.—Temp. Major John Heatly Spencer, M.B., with precedence next below R. O'Kelly.

Dated April 5, 1918.—Temp. Capt. John Smith Knox Boyd, M.B., with precedence next below D. Bell.

Dated July 31, 1918.—Temp. Capt. Charles Michael Forster, with precedence next below D. W. Beamish.

Dated August 8, 1918.—Temp. Capt. Kenneth Montague Nelson, M.C., with precedence next below C. G. G. Keane.

Dated January 26, 1919.—Temp. Capt. Eric Underhill, M.B., with precedence next below R. Stowers.

Dated July 10, 1919.—Temp. Capt. William Millerick, M.C., with precedence next below B. L. Davis.

Dated December 15, 1919.—Temp. Capt. James Harold Sharpe, M.B., with precedence next below W. E. Hodgins.

Dated January 24, 1920.—Temp. Capt. Willis Clarence Connell, M.B., with precedence next below J. Bennet.

Dated February 7, 1920.—Capt. William Hood Dye, from Special Reserve, with precedence next below W. D. Whamond.

Dated March 1, 1920.—Temp. Capt. James Valentine McNally, M.B., with precedence next below A. H. Clarke.

Dated May 15, 1920.—Capt. Ernest Oscar Adolphus Singer, M.B., from Special Reserve, with precedence next below A. Rodd.

The undermentioned Temporary Captains to be Captains:—

Dated June 24, 1918.—Capt. William Edward Kyte Coles, late Royal Army Medical Corps, but not to reckon for pay or allowances prior to June 18, 1920, with precedence next below T. J. L. Thompson.

Dated February 28, 1919.—Temp. Capt. John Wright Malcolm, M.C., M.B., but not to reckon for pay or allowances prior to July 1, 1920, with precedence next below J. T. Scrogie.

Dated December 9, 1919.—Capt. Colin Charles Gordon Gibson, late Royal Army Medical Corps, but not to reckon for pay or allowances prior to June 14, 1920, with precedence next below H. J. Bensted.

Dated March 11, 1920.—Capt. Herman Gerald Dressing, M.C., late Royal Army Medical Corps, but not to reckon for pay or allowances prior to June 5, 1920, with precedence next below A. H. Clarke.

The undermentioned to be Captains:—

Dated April 10, 1918.—Temp. Capt. Alexander Erskine Drynan, M.C., M.B., but not to reckon for pay or allowances prior to July 1, 1920, with precedence next below S. Fenwick.

Dated November 17, 1918.—Capt. Daniel McVicker, M.B., late Temporary Captain, Royal Army Medical Corps, but not to reckon for pay or allowances prior to July 3, 1920, with precedence next below L. A. J. Graham.

Lieutenants (Temporary Captains):—

Dated June 20, 1920.—John A. Cowan, M.B.

Dated July 1, 1920.—John P. Macnamara, M.B.; James W. Hyatt; Thomas Stanton, M.B.

Dated July 2, 1920.—Thomas Parr, M.B.

Dated July 19, 1920.—Arthur P. Draper, M.C., M.D.

Dated July 20, 1920.—James R. S. Mackay, M.B.

The undermentioned Temporary Captains relinquish their commissions:—

Dated June 11, 1919.—Andrew Topping, M.B., and is granted the rank of Major. (Substituted for the notification in the *Gazette* of July 21, 1919.)

Dated July 1, 1920.—Acting Major John A. Mackenzie, M.B., and is granted the rank of Major.

The undermentioned Temporary Captains relinquish their commissions, and are granted the rank of Major:—

Dated April 1, 1920.—Dennis C. McCabe-Dallas.

Dated July 4, 1920.—Daniel Gillespie, M.D.

Dated July 7, 1920.—Philip Murphy, M.B.; John P. Mathie.

The undermentioned Temporary Captains relinquish their commissions and retain the rank of Captain:—

Dated March 16, 1920.—Francis C. Watson.

Dated April 1, 1920.—Harold R. S. Walford.

Dated April 11, 1920.—George L. Neil, O.B.E.

Dated May 20, 1918.—Arthur McK. Bell, M.B.

Dated May 25, 1920.—Robert C. De Lacey, M.B.

Dated June 18, 1920.—Charles E. H. Paley.

Dated June 19, 1920.—Ian M. Grant, M.D.

Dated June 22, 1920.—Matthew M. Frew, M.B.; Walter B. Bannerman; Crispian Stanley-Clarke; John M. Mitchell, M.B.

Dated June 23, 1920.—William B. U. Patterson, M.B.; Albert P. Adams; Percy E. B Barrow, M.B.; Stephen H. Pitcairn.
Dated June 26, 1920.—George B. McTavish, M.C., M.D.
Dated June 29, 1920.—Guy de H. Dawson, D.S.O., M.C.
Dated July 4, 1920.—Henry R. Hurry.
Dated July 6, 1920.—Andrew M. Niven, M.B.; James A. Bateman, M.B.
Dated July 7, 1920.—Augustus C. Greenwood; Andrew C. Wilson, M.D.; William A. Higgins, M.B.; George Maclean, M.B.; Edgar Tanton, M.B., F.R.C.S.; Aubrey J. C. Tingey; Tom W. J. Childs, M.B.; Albert S. Sieger; Alexander W. C. Bennett; Harry C. Hopkinson.
Dated July 10, 1920.—Bloomfield G. H. Connolly, M.C., M.B.; Peter S. Maclaren, M.D.
Dated July 13, 1920.—John V. O. Andrews.
The undermentioned late Royal Army Medical Corps Special Reserve to be Temporary Captains:—
Dated April 9, 1920.—Lawrence Handy.
Dated May 10, 1920.—John Wright Malcolm, M.C., M.B.

SPECIAL RESERVE OF OFFICERS.

Royal Army Medical Corps.

Capt. Basil W. Brown, M.B., relinquishes his commission, dated July 17, 1920, and retains the rank of Captain.
Capt. John S. Cocks to be acting Major, dated October 27, 1918.
Capt. (Acting Major) John S. Cocks relinquishes the pay and allowances of his acting rank, dated January 17, 1919.
Capt. Arthur H. Habgood, D.S.O., M.B., relinquishes his commission on account of ill-health caused by wounds, dated July 31, 1920, and is granted the rank of Lieutenant-Colonel.
The undermentioned Captains relinquish their commissions, dated August 6, 1920:—
John J. McI. Shaw, M.C., M.B., and is granted the rank of Major.
John W. Gray, M.B., and retains the rank of Captain.
Capt. Sydney J. V. Furlong, M.B., relinquishes the acting rank of Major, dated March 27, 1919.

NOTES FROM NO. 7 COMPANY, ROYAL ARMY MEDICAL CORPS, DEVONPORT.—With more settled weather the cricket at Devonport would be in full swing, but rain appears to have quite a liking to visit us the morning of a cricket match, thereby rendering play impossible. However, both of the matches played by the Company have been won, one against the Royal Army Service Corps, and the other against the Royal Army Ordnance Corps. In the former match, Capt. D. K. Waldron and Serjt. P. G. Truscott batted brilliantly, scoring 101 and 37 respectively, beside Serjt. Truscott taking 5 wickets for 12 runs. In the match with the Royal Army Ordnance Corps Capt. Waldron again played splendidly, scoring 45 and securing 5 wickets at a low cost. Capt. Webb and Capt. Yeates also batted with perfect style and skill, the former scoring 69 and the latter 29. A combined team of Royal Army Ordnance Corps and Royal Army Medical Corps also defeated the Royal Garrison Artillery in a well contested game at Mount Wise, the first defeat of this team for the season. The Royal Army Medical Corps were represented by Capt. Waldron, Capt Webb, Serjt.-Major Robinson and Serjt. Truscott, who completely turned the game in favour of the Corps.

A social evening in the shape of a smoking concert took place in the Men's Dining Hall on July 13, 1920, as a farewell to the one-year men. Several officers and members of the Serjeants' Mess were present, and a thoroughly enjoyable evening was spent. The artists, who were all personnel of No. 7 Company, Royal Army Medical Corps, were heartily applauded for their turns, and some were exceptionally good. Special mention should be made of Pte. Wilson, M.M., who proved himself a comedian of high qualities.

The annual outing of the Serjeants' Mess took place on June 15, 1920, to that charming place, Torquay, where the beauties of Devon are illustrated to a noted degree of perfection. The Mess were accompanied by their wives, families and friends, who declared the outing one of complete success. The journey was made by char-a-banc, and driving over the well known and beautiful moors of Devon afforded the Mess members a brilliant opportunity of forgetting their service occupation and seeing those sights which have called forth such noted praise by England's greatest poets and writers.

It is regretted that owing to the shortage of staff, and distance from Devonport, No. 7 Company, Royal Army Medical Corps, will not be sending any competitors to Aldershot to compete in the athletic sports, which at first was thought practicable.

NOTES FROM LUCKNOW.—Royal Army Medical Corps Officers who remember Lucknow in the old days may be interested to have notes from this popular station. Some of us coming back after many years with the memory of those good times still fresh undoubtedly received a shock on realizing the evil days that have fallen upon the mess. As in the case of many others, this is the result of course of the restrictions put on Mess subscription, etc., during war time

In consequence it will be some considerable time before the glories and traditions of those days are revived, but all officers here are working hard to this end.

The old mess house in Canning Road was given up owing to sudden collapse during a rain storm, and another taken, No. 56, Mayo Road. This though smaller is in some ways, notably in the possession of a large shady garden, an improvement on the old one, and there is an excellent tennis court. This it is hoped will be the means of our entering a team for some of the events in the winter. It is also hoped that a four will be found to row, but new blood is required at present. No one as yet has been able to collect any polo ponies and an occasional gallop after pig or at a paper chase is all one can aspire to at present.

All of us are suffering from the effects of particularly trying hot weather, and are anxiously awaiting the arrival of a monsoon which never comes.

The troops in the station consist mostly of young soldiers with no experience of the East, and they naturally are suffering considerably from the heat. Several cases of heat stroke have occurred as one would expect with a maximum wet bulb reading of over 90° sometimes, but more universal misery is probably produced amongst them by prickly heat; and a death directly due to this cause has recently occurred which is unique in the experience of the writer.

The station presents the appearance usual at this time of year, a few ladies are still to be seen at the Mohamad Bagh Club, whilst the United Service Club is almost deserted except on Saturday night when there is a ladies dinner, and a few enthusiasts attempt to dance.

Col. Gallie has handed over command of the Station Hospital and has proceeded to Simla to take over the duties of D.D.M.S. His loss is much felt here while every one wishes him success in his new appointment.

Major Anthonisz, who was commanding No. 54 Combined Field Ambulance, has recently received orders to hand over command to Major Arthur, and to proceed to Wellington where we hope he will do the big things at golf that he was sure to have done here.

NOTES FROM THE BERMUDA COMMAND.—No. 25 Company has survived the reorganization following the end of the war, but has survived with diminished numbers.

The Bungalow still houses the men of the Corps employed at Prospect Headquarters and remains on the Company's charge. It is still as popular as ever, and although other barracks may be empty it is still full, the vacant places being filled by Royal Engineers, Royal Army Service Corps, and Royal Army Ordnance Department, who are attached for "rations and accommodation." This is all to the good, as it brings added life to the Bungalow Sports Club. The cricket team in particular has put in some good work, and being newly equipped with bats and gear has been able to play some matches.

On May 13 the team succeeded in defeating a platoon team of the detachment of the 2nd Royal Sussex Regiment. Of the Royal Army Medical Corps playing, Pte. Welch contributed a very useful score of 51 not out, and also took 4 wickets for 9 runs. Serjt. Bow took 2 wickets for 6 runs.

In a match played against the Royal Engineers at St. George's on June 15, good scores were made for the Bungalow team by Sapper Stinchcoombe, Royal Engineers, 56, and Staff-Serjt. Fredericks, Royal Army Service Corps, 52. Pte. Taylor, Royal Army Medical Corps, took 3 wickets for 7 runs. This was an exciting match, as the Bungalow team declared at 7 wickets for 142 runs, and the Royal Engineers' team were only finally disposed of for 127 runs with four minutes of time to spare. Pte. Taylor's contribution to the rapid fall of the last few wickets converted what looked like being a draw into a very satisfactory win for his team.

In a match played by the Garrison *versus* Mr. Beresford's team, Major Sutton, Royal Army Medical Corps, took 8 wickets for 47 runs.

The month of May saw the birth of a daughter to Major A. E. Sutton, M.C., Royal Army Medical Corps, at Prospect, and June the birth of a daughter to Staff Serjt. F. E. Hort, Royal Army Medical Corps, at St. George's.

Lieut.-Col. D. O. Hyde, Royal Army Medical Corps, has this month won the Cornwall Cup for Golf. This is only the third occasion on which the Cup has been held by an officer of the Corps since it was presented, for six-monthly competition, by the Duke of Cornwall's Light Infantry ten years ago. The previous holder of the Cup was Major E. W. W. Cockrane, who won it in November, 1911, and May, 1913. The Military Golf Links at Prospect are at present the best in the island; though only a nine-hole course it is very pleasantly situated, and is a very sporting little course. Bermuda has in hand a large scheme for a new Golf Course, which is to form an attraction for American visitors. This scheme will probably cost some thousands of pounds and has not yet materialized. The Director of Agriculture is at present engaged on some extensive experiments with various types of grass seed with a view of finding a type of grass which will survive the heat of summer and yet provide a better surface for golf greens than the natural grass of the islands. The natural Bermuda type is the "Crab" grass, which grows along the surface of the ground, pushing down tufts of roots at intervals. Unless very carefully tended, the grass forms a stem about the thickness of a knitting needle, and lying parallel with the ground produces disastrous results on a putting green.

Serjt.-Major C. A. Burton, with his wife and family, have left for England by passenger steamer. In common with many others they have been waiting a long while for their passages.

So great is the stream of American visitors to Europe that the difficulty of obtaining accommodation is almost incredible. Serjt.-Major Burton has had a long tour in these islands. Both in his work and in the ordinary intercourse of garrison life he made many friends who wish him good fortune on his return home.

Lieut.-Col. D. O. Hyde has been appointed by H.E. the Governor as a member of the governing body of the New Bermuda General Hospital. This hospital is named in memory of King Edward VII, and was to have been opened just before the war. As the result of the war, orders for fittings, furniture, and other things, which were to have been consigned from England, had to be cancelled. It will be understood that the provision of similar articles at the present time has entailed some adjustments of estimates of cost. This hospital has been badly needed for some time, as the Cottage Hospital which has done splendid work for many years is now far too small to deal with the present demands for accommodation, and in the absence of any Military Families Hospital it is to this hospital we have to look for the accommodation of women and children who become seriously ill.

The post of Secretary to the hospital and Laboratory Assistant has been offered to Serjt. T. Trotman, who having served in Bermuda for some years in the Military Laboratory went home a year ago to take his discharge. The post carries a salary of £300 (three hundred pounds) a year with pension according to the rates laid down for Government servants in the Colony.

The new Syllabus of Training has reached the Command and has been anxiously consulted, with the result that there is much activity and study. The climate of Bermuda in the summer months is apt to overpower even determined efforts at concentration of attention, but after all the capacity for success is the capacity to overcome our environment.

NOTES FROM QUETTA.—Quetta is a curious Division from the Corps point of view, in that the only official Royal Army Medical Corps Station in it is Quetta itself, so that these notes are necessarily confined to that place. At the moment of writing there are three officers outside Quetta, Major O'Carroll at Chaman, Major Richmond at Loralai, and Capt. Grant at Fort Sandeman. This unusual state of affairs is due to the present shortage of I.M.S. Officers in this Division. Major O'Carroll is Senior Medical Officer of the composite Brigade which was sent to Chaman as a precautionary measure some little time ago. Now that things are settling down we hope to see him back in Quetta shortly. Major Richmond is Senior Medical Officer, Loralai, and well authenticated report has it that he likes being there.

A list of officers present in the Division will be found at the end of this, and subsequent, letters.

Of sport there is very little in this barren part of the world, and correspondingly little to say about it. Some of us rode to the Quetta hounds through the late hunting season—October to March—but we all rallied and presented a bold front at the Hunt Ball at the end of it. We were also represented at the Point-to-Point Races held, as usual, in March, but without success from the "Acquiring of Trophies" point of view. (Temp. Major Blackmore and Captain Sharpe.)

We of the British Station Hospital entered a team for the Hockey Tournament with the lamentable result that we were beaten to the tune of double figures in the first round; our only consolation being that our conquerors were eventually the winners of the Competition.

Polo is now in full swing and those of us who are sufficiently callous in the matter of debts play the game, but the price and upkeep of ponies here is ruinous.

Tennis also is well under way and we have hopes of annexing something in the Tournaments which do not take place until late in the summer; not that we have any such shining light as Ritchie, who was with us for a short time two years ago, but because "Hope springs, etc."

In the world of Golf we have been very successful. In the open Tournament just concluded we secured a very fair share of the prizes, and amongst them the most coveted one, viz., the Baluchistan Cup: a scratch competition for the Championship of Baluchistan which was won by Captain J. Bryan Fotheringham, who has a great future before him. He is a brother of the present Scottish Amateur Champion, also a member of the Corps and at present stationed at Malta, and when the pair of brothers get together they will take a lot of stopping; in them we have the nucleus of a team capable of worthily representing the Corps in the inter-regimental Championship at home.

The Royal Army Medical Corps officers stationed here presented a Challange Cup to the Club with a small replica for the best scratch score returned. Capt. Fotheringham also secured this scratch prize from a field containing many scratch and one or two plus players.

The "Hon. Sec." of the Club, Major Egan, partnered Col. Packer and the pair after some desperate matches won the Men's Handicap foursomes.

The Inter-Regimental Cup (a scratch competition) open to all the regiments and departments in the Division, Major Egan and Capt. Fotheringham represented the Corps. They were beaten on the 18th Green in the final by the Staff College (represented by a plus 1 and a scratch man), and we feel that with a little luck we might have pulled it off; we live in hopes however of winning it next year.

In the Men's Open Handicap, Col. Packer after many hard fights reached the final in which he was only just beaten after an exciting struggle.

Mrs. Packer won the Ladies' Handicap Singles after many strenuous games, so we feel that we have done very well in this increasingly popular sport.

We had a bitterly cold snap in January, plus heavy falls of snow which kept us all close to the fire for some days. The Spring was delightful and the "Hot Weather" has so far been so in name only.

It is a sad pleasure to record the feeling of loss, which all who knew him here felt at the death of Brevet Major Balfour. Short as was the time he had spent with us in Quetta he had endeared himself to all he met, and many are there here who miss him.

Royal Army Medical Corps Officers Present in the Division

Lieut.-Col. H. D. Packer.
Major B. H. V. Dunbar, D.S.O.
Major J. D. Richmond, D.S.O., O.B.E.
Major H. C. Winckworth.
Major W. Egan, D.S.O.
Major D. de C. O'Grady, D.S.O.
Major J. O'Carroll, D.S.O.
Temp. Major H. S. Blackmore.
Capt. W. Stewart.
Capt. J. B. Fotheringham.
Capt. Salisbury Sharpe.
Capt. A. G. P. Hardwick, M.C.
Capt. J. S. Wilson (Territorial)
Capt. S. R. Prall (Territorial).
Capt. P. Grant (Territorial).

DINNER IN HONOUR OF THE ARMY MEDICAL DEPARTMENT AND THE EMINENT CIVILIANS ATTACHED TO IT DURING THE WAR.

As briefly notified in the July number of the Journal, a dinner "in appreciation of the splendid services of the Royal Army Medical Corps and eminent civilians attached to it during the war," was given by the following hosts at the Connaught Rooms on June 8. The guest of the evening was Lieut.-Gen. Sir Alfred Keogh, G.C.B., G.C.V.O., C.B.

The Viscount Burnham, C.B.E.
The Earl of Derby, K.G., G C.V.O., C.B.
The Earl of Donoughmore, K.P.
The Viscount St. Davids.
Lord Desborough.
Sir John Ellerman.
The Earl Fitzwilliam, K.C.V.O., C.B.E., D.S.O.
Sir Alan Hutchings, K.B.E.
Sir Heath Harrison, Bart.
Sir Vesey Holt, K.B.E.
Lord Harris, C.B., G.C.S.I., G.C.I.E.
Lord Inchcape, G.C.M.G., K.C.S.I., K.C.I.E.
The Viscount Knutsford.
The Marquess of Lansdowne, K.G., G.C.M.G., C.B., G.C.I.E.
Sir Walter Lawrence, Bart., G.C.V.O., C.B., G.C.I.E.
Lord Lee of Fareham, G.B.E., K.C.B.
The Earl of Midleton, K.P.
Sir Wm. B. Peat.
Sir Ivor Phillips.
Lord Queenborough.
Sir Samuel Scott, Bart.
The Marquess of Salisbury, K.G., G.C.V.O., C.B.
Lord Somerleyton, K.C.V.O.
Major-Gen. the Rt. Hon. J. E. B. Seely, C.B., D.S.O.
The Earl of Scarborough, K.C.B.
Sir Arthur Stanley.
The Rt. Hon. H. J. Tennant.
Lord Edmond Talbot, M.V.O., D.S.O.
Sir Edward Ward, Bart., G.B.E., K.C.B., K.C.V.O.
Lord Wavertree.

Chairman—The Rt. Hon. the Earl of Midleton, K.P.

The arrangements were carried out by the Dinner Committee, consisting of:—

The Earl of Derby, K.G.
The Earl of Midleton, K.P.
Major-Gen. Rt. Hon. J. Seely, D.S.O., M.P.
The Rt. Hon. H. J. Tennant.
Col. Lord Edmund Talbot, D.S.O., M.P.
Col. Sir Edward Ward, G.B.E., K.C.B., K.C.V.O.

At one long table the principal Guests and their Hosts were seated in the order given below; at each of the smaller tables one of the Hosts presided, with from six to eight guests, as follows:—

PRINCIPAL TABLE.

Major-Gen. Sir Anthony Bowlby, K.C.B., K.C.M.G., K.C.V.O.
Lieut.-Gen. Sir. T. E. Clarke, K.C.M.G., C.B.
Col. Sir H. B. Barling, Bt., C.B., C.M.G., C.B.E.
Gen. Sir Archibald Murray.
Col. Sir W. Arbuthnot Lane, Bt., C.B.
The Viscount Burnham, C.B.E.
Lieut.-Gen. Sir Arthur Sloggett, K.C.B., K.C.M.G., K.C.V.O.
The Earl Fitzwilliam, K.C.V.O., C.B.E., D.S.O.
Gen. Lord Horne, G.C.B., K.C.M.G.

Major-Gen. Sir George Makins, G.C.M.G., C.B.
Lieut.-Gen. Sir G. M. Macdonough, K.C.M.G., C.B.
The Earl of Donoughmore, K.P.
Field Marshal Lord Methuen, G.C.B., G.C.V.O., K.C.V.O., C.M.G.
Lieut-Gen. Sir John Goodwin, K.C.B., C.M.G., D.S.O.
The Right Honourable Winston Churchill.
The Earl of Midleton, K.P. (Chairman).
Lieut.-Gen. Sir Alfred Keogh, G.C.B., G.C.V.O., C.B.
Field Marshal The Earl Haig, K.T., G.C.B., G.C.V.O., K.C.I.E.
Major-Gen. Lord Dawson of Penn., G.C.V.O., C.B.
The Marquess of Salisbury K.G., G.C.V.O., C.B.
Lieut-Gen. Sir William Babtie, V.C., K.C.B., K.C.M.G.
Gen. Lord Rawlinson, G.C.B., G.C.V.O., K.C.M.G.
The Earl of Scarborough, K.C.B.
Lieut.-Gen. Sir L. Gubbins, K.C.B.
Gen. Sir Ian Hamilton, G.C.B., D.S.O.
Major-Gen. Sir T. Gallwey, K.C.M.G., C.B.
Sir Charles Ballance, K.C.M.G., C.B., M.V.O.
Major-Gen. Sir David Bruce, K.C.B., F.R.S.
The Right Honourable Sir Archibald Williamson, Bt., M.P.
Major-Gen. Sir G. Evatt, K.C.B.
Major-Gen. Sir Berkeley Moynihan, K.C.M.G., C.B.

TABLE No. 1.

Lord Somerleyton, K.C.V.O.
Major-Gen. Sir T. J. O'Donnell, K.C.I.E., C.B., D.S.O.
Lieut.-Col. P. S. Lelean, C.B.
Sir T. Jenner Verrall.
Col. Sir C. Gordon Watson, K.B.E., C.M.G.
Col. A. G. Phear, C.B.
Col. W. Pasteur, C.B., C.M.G.

TABLE No. 2.

Lord Desborough, K.C.V.O.
Major-Gen. S. Guise Moores, C.B., C.M.G.,
Col. H. A. Hinge, C.B., C.M.G., D.S.O.
Sir J. Lynn Thomas, K.B.E., C.B., C.M.G.
Col. Sir W. Thorburn, K.B.E., C.B., C.M.G.
Col. T. H. Openshaw, C.B., C.M.G.
Col. J. H. Parsons, C.B.E.
Col. T. Sinclair, C.B.

TABLE No. 3.

Major-Gen. The Rt. Hon. J. Seeley, C.B., D.S.O.
Col. C. K. Morgan, C.B., C.M.G.
Col. E. F. Buzzard.
Col. A. Carless, C.B.E.
Col. A. H. Tubby, C.B., C.M.G.
Col. W. Aldren Turner, C.B.
Col. S. Flemming.
Major-Gen. A. A. Sutton, C.B., D.S.O.

TABLE No. 4.

Lord Edmund Talbot, M.V.O., D.S.O.
Major-Gen. S. Macdonald, C.B., C.M.G.
Lieut.-Col. F. R. Hill, C.B.E.
Col. Sir R. Ross, K.C.B., K.C.M.G., F.R.S.
Col. Sir J. Purves Stewart, K.C.M.G., C.B.
Col. J. A. Nixon, C.M.G.
Dr. N. G. Horner.
Major-Gen. Sir R. Jones, K.B.E., C.B.

PRESS TABLE.

TABLE No. 5.

Sir Edward Ward, Bt., G.B.E., K.C.B., K.C.V.O.
Major-Gen. Sir W. Macpherson, K.C.M.G., C.B.
Col. Sir H. E. Bruce-Porter, K.B.E., C.M.G.
Col. Sir E. Worthington, K.C.V.O., C.B., C.M.G.
Col. Sir H. Gray, K.B.E., C.B., C.M.G.
Sir J. Hodsdon, M.D.
Dr. S. Squire Sprigge, M.D.

TABLE No. 6.

The Viscount Knutsford.
Col. D. Harvey, C.M.G., C.B.E.
Lieut.-Col. Sir H. M. Rigby, K.C.V.O.
Col. Sir A. Mayo Robson, K.B.E., C.B., C.V.O.
Major A. G. Stirling, D.S.O.
Dr. N. Walker, M.D.
Dr. V. Warren Lowe, C.B., M.D.
Major-Gen. Sir J. M. Irwin, K.C.M.G., C.B.

TABLE No. 7.

The Rt. Hon. H. J. Tennant.
Major-Gen. Sir R. S. F. Henderson, K.C.M.G., C.B.
Col. J. V. Forrest, C.B., C.M.G.
Col. Sir T. Myles, C.B.
Sir A. Reid, C.M.G.
Major G. A. D. Harvey, C.M.G.
Col. W. Hunter, C.B.
Col. A. B. Soltau, C.M.G., C.B.E.

TABLE No. 8.

Sir Samuel Scott, Bt.
Col. Sir J. Magill, K.C.B.
Lieut.-Col. Sir J. Kingston Fowler, K.C.V.O., C.M.G.
Col. Sir J. Galloway, K.B.E., C.B.E.
Col. C. R. Tyrrell, C.B., C.B.E.
Lieut.-Col. A. B. Smallman, C.B.E., D.S.O.
Lieut.-Col. Wardrop Griffith, C.M.G.
Major-Gen. G. Cree, C.B., C.M.G.

TABLE No. 9.

Col. H. E. R. James, C.B., C.M.G., C.B.E.
Major-Gen. A. G. Blenkinsop, C.B., C.M.G.
Brigadier-Gen. M. H. G. Fell, C.B., C.M.G.
Col. Sir R. Firth, K.B.E., C.B.
Col. Sir T. Crisp English, K.C.M.G.
Sir W. M. Fletcher, K.B.E.
Col. G. E. Gask, C.M.G.
Major-Gen. Sir C. Wallace, K.C.M.G., C.B.

TABLE No. 10.

Sir Vesey Holt, K.B.E.
Col. Sir Lisle Webb, K.B.E., C.B., C.M.G.
Lieut.-Col. Sir A. Garrod, K.C.M.G.
Sir E. Marriott Cooke, K.B.E.
Lieut.-Col. T. E. Twist, C.M.G.
Lieut.-Col. H. French, C.B.E.
Lieut.-Col. G. M. Holmes, C.M.G., C.B.E.
Major General Sir W. Donovan, K.C.B.

TABLE No. 11.

Sir W. Lawrence, Bt. G.C.V.O., C.B., G.C.I.E.
Major-Gen. Sir W. G. Bedford, K.C.M.G., C.B.
Col. S. L. Cummins, C.B., C.M.G.
Col. Sir W. T. Lister, K.C.M.G.
Lieut.-Col. Sir F. Mott, K.B.E.
Major P. G. Easton, C.B.E., D.S.O.
Col. W. E. Hume.
Lieut.-Col. F. S. Brereton, C.B.E.

TABLE No. 12.

Lieut.-Col. F. E. Fremantle, M.P., O.B.E.
Major-Gen. Sir M. Russell, K.C.M.G., C.B.
Col. G. A. Moore, C.M.G., D.S.O.
Lieut.-Col. G. S. Buchanan, C.B.
Col. F. F. Burghard, C.B.
Col. H. H. Tooth, C.B., C.M.G.
Col. W. Taylor, C.B.

TABLE No. 13.

Lord Wavertree.
Major-Gen. Sir M. W. O'Keefe, K.C.M.G., C.B.
Lieut.-Col. E. C. M. Smith, C.M.G., D.S.O.
Col. Sir Hale White, K.B.E.
Col. Sir W. I. C. Wheeler.
Lieut.-Col. P. Sargent, C.M.G., D.S.O.
Col. A. D. Sharp, C.B., C.M.G.

TABLE No. 14.

Sir Alan Hutchings, K.B.E.
Major-Gen. Sir G. Stanistreet, K.B.E., C.B., C.M.G.
Brigadier-General W. W. O. Beveridge, C.B., C.B.E., D.S.O.
Lieut.-Col. Sir J. R. A. Clark, Bt., C.B., C.M.G.
Sir Napier Burnett, K.B.E.
Col. Sir H. Davy, K.B.E., C.B.
Col. Bernard Myers.
Col. G. St. C. Thom, C.B., C.M.G., C.B.E.

TABLE No. 15.

Lord Lee of Fareham, G.B.E., K.C.B.
Major-Gen. Sir W. W. Kenny, C.B.
Col. O. L. Robinson, C.B., C.M.G., K.H.P.
Col. L. S. Dudgeon, C.M.G., C.B.E.
Col. A. S. Woodwark, C.M.G., C.B.E.
Col. W. H. Willcox, C.B., C.M.G.
Col. H. L. Eason, C.B. C.M.G.

TABLE No. 16.

Lord Harris, G.C.S.I., G.C.I.E., C.B.
Major-Gen. Sir T. Yarr, K.C.M.G., C.B.
Col. C. E. Pollock, C.B.E., D.S.O.
Col. R. Davies-Colley, C.M.G.
Col. J. M. Cowan, C.B.E.
Lieut.-Col. A. White-Robertson.
Col. C. M. Wenyon, C.M.G., C.B.E.

TABLE No. 17.

Sir Arthur Stanley.
Major-Gen. Sir W. W. Pike, K.C.M.G., D.S.O.
Col. J. R. McMunn, C.B., C.M.G.
Lieut.-Col. A. Balfour, C.B., C.M.G.
Dr. C. Hubert Bond, M.B.
Col. J. Sherran, C.B.E.
Col. S. Maynard Smith, C.B.

TABLE No. 18.

Sir Herbert Creedy, K.C.B., M.V.O.
Bt. Lieut.-Col. W. C. Smales, D.S.O.
Col. W. McAdam Eccles.
Col. T. R. Elliott, C.B.E., D.S.O.
Major R. C. Elmslie, O.B.E.
Capt. A. R. Wright, D.S.O.

TABLE No. 19.

Sir Ivor Phillips.
Major-Gen. Sir H. R. Whitehead, K.C.B.
Col. E. M. Pilcher, C.B., C.B.E., D.S.O.
Col. W. Coates, C.B.
Col. Maurice Craig, C.B.E.
Dr. E. B. Turner.
Col. A. E. Webb Johnson, C.B.E., D.S.O.

The toast of "the King" having been duly honoured: Sir EDWARD WARD: "My Lords and Gentlemen, I am requested by Lord Middleton, our chairman, to read some messages which have been received. The first message is from Field-Marshal His Royal Highness the Duke of Connaught, Colonel-in-Chief of the Royal Army Medical Corps. This letter is a reply to a letter written by me on behalf of the committee regretting that His Royal Highness's recent severe loss would prevent him being present. Sir Malcolm Murray says 'I have informed the Duke of Connaught of the dinner which you and others are giving to the Royal Army Medical Corps, as well as to other eminent civilians who have been attached to them during the war. He is so pleased to hear of this, and only regrets that his being in such deep mourning prevents his accepting the invitation which you so kindly say you would send him. As Colonel-in-Chief of the Corps, His Royal Highness would like to assure your guests how much the great work that they have done during the war has been appreciated, and by none more than by himself, who is proud to be Colonel-in-Chief of the Royal Army Medical Corps. Believe me, yours sincerely, Malcolm Murray.' Lord Derby telegraphed from Paris to Lord Middleton saying, 'Deeply regret unable to be with you tomorrow at dinner given in honour of the Royal Army Medical Department, and in recognition of the splendid work they did during the war. Please remember me to any of my friends present.—Derby.' Lord French has written from Ireland a few days ago, explaining how anxious he was to be present, but he says, 'It may be impossible, and if so, please understand that I would come if I could, but you know how difficult it is to make any plans in the present situation of affairs in Ireland.' Letters of regret have been received from Lord Byng of Vimy, Lord Islington, Lord Lee of Fareham, Field-Marshal Sir William Robertson, and many others."

The Rt. Hon. The EARL OF MIDLETON: "My lords and gentlemen, it is due only to the unenviable reason, that, with the exception of Lord Lansdowne, who is unable to be present, I am the senior in point of date of those who have held the office of Secretary of State for War, that I am privileged to-night to be the spokesman of those who are acting as hosts at this unique

gathering. It is doubly unique because I believe it is the only case since the Armistice that a particular branch of the Army has been the object of a public ovation, and still more remarkable when we contrast it with the attitude of the nation to all but the combatant branches of the Army in past wars. The Crimean War cost the Ministry of the day its life, but it could not kill the War Office, for the War Office of that day had never been alive. In 1886, Lord Wolseley's brilliant dash up the Nile was almost obscured by the impeachment of War Office inefficiency and extravagance which followed it, in which Lord R. Churchill, recalling the straight speaking of his illustrious ancestor, showed an hereditary genius for criticism, which lost nothing in the hands of my distinguished friend beside me, when after the Boer War, he went for all parties concerned with great impartiality. Yet in the Boer War the War Office actually maintained a force of 250,000 men in the field within six months of opening hostilities: no mean effort for a department which had only been allowed to organize to send 70,000 men abroad. It would have been strange indeed if the Medical Service had escaped the general holocaust, seeing that in every war up to the present it was hurried into the field, although starved in numbers for peace service, insufficiently paid, without leisure or opportunity for scientific training, secluded by a water-tight partition from the great civil profession which could be its only effective reserve, with scant opportunity for practising modern surgery, and confined to a medical curriculum, the records of which were mainly a study in erotic literature. In the field it invariably took a back seat: there are men in this room who can remember the days when, in a large cantonment, the only site assigned for a hospital where capital operations were to be performed, was a vacant spot between a dust heap and a slaughter house, and when the last man to hear of any intended move of the Army was the senior medical officer. To a department so restricted, peace was a necessity.

"With such a chequered past, surely the poorest orator must find inspiration from the records of the war just gloriously terminated. No Cabinet before 1911 contemplated our participation in European War. As Lord Kitchener said, on taking office in 1914, 'The Expeditionary Force will last six weeks. How are we to get through the next three years?' Yet what the poet said of the British nation is true of the War Office :—

'Be this remembered, when the trumpets blared
They found it ready though all unprepared.'

"There is nothing in military history to compare with the development of the British force. The men who retreated from Mons, less than one hundred thousand in number, had been reinforced to five millions before the war was half over, to the confusion of those who imagined that, without years of compulsory military service, we could not have got the officers or non-commissioned officers to train them; and our War Office may well boast that these vast hosts, as soon as munitions became available, were better found, better fed, and better run than any other army in the field. One could wish that the mass of scribes, arm-chair critics and Members of Parliament, who, for fifty years after the Crimean War, made the War Office the butt of the Government services, could be present here to-night, they would, I feel convinced, in the face of this record raise their hats to the Department, and say of it, as was said of our Army in the past, that it worked harder, talked less about it, and received less credit than any army in the world. And if a review were to be now held of the departments of the Army, and if the award of excellence be given solely for progress since 1900, I would make bold to say that the Commander-in-Chief in ordering the parade would not be unlikely to place the Army Medical Department on the right of the line.

"Times have changed, indeed, since the Head of the Army used to see the Head of the Army Medical Department as he did the Head of the Intelligence Department, perfunctorily once or twice a year, regarding them as a tolerable, though inconspicuous adjunct of military operations. Reform began in these respects from the date that Lord Wolseley became Adjutant-General in 1882, and we owe to him and Lord Roberts the training and organization which enabled Lord French to save France and Lord Haig to defeat Germany. Under those two great chiefs the men who held commands in peace were so chosen as to hold the same commands in war; the equipment designed for peace was the same as the equipment for war, the gap between civilian and professional soldiers was bridged over so that the professional service could be developed into a national force. These principles were so applied by the Army Medical Department in the years before the war that they conciliated to themselves the entire support of the great civil profession, the most eminent members of which are with us here to-night. The equipment was so overhauled that no change was necessary in it in any of the campaigns since 1914. A sanitary branch was organized in 1908 and while typhus, which from time immemorial had been the scourge of armies, was kept wholly at bay; enteric fever which ravaged the troops in South Africa, notwithstanding the flooded trenches of Flanders and the great congestion of armies, received a knock-down blow in 1915. You will pardon me for recalling the figures: in South Africa, the cases of the typhoid group were 60,000 and deaths 8,000; our French allies, in the first fifteen months of the war, had 96,000 cases and deaths 12,000; our records show in France, Egypt, Salonika, Italy, and Mesopotamia, 15,800 cases and deaths 766. These figures speak for themselves, and constitute the finest record of the war. It is the misfortune of statesmen that they are judged only by the measures which they carry and not by the evils which they have prevented. The taking of your enemy's life is a more alluring theme than the preservation

of your own. When you think if the South African standard had been maintained, instead of 16,000 cases of typhoid, we should have had 1,200,000 during the war, and instead of 8,000 deaths we should have had 160,000, we may truly say inoculation has won as many battles for us as any of the distinguished commanders who have honoured us with their presence to-night. I submit that scientists like Sir Almroth Wright may stand beside any General, and the man who discovered the "Leishman Bacillus," deserves as much of his country as the man who invented the Lewis gun. All the same, if the courage of the Army Medical Department had not been proved upon 100 fields, when I reflect that they administered 33,000,000 doses of inoculation during the war, and think of the inconvenience that most of their hosts to-night experienced from their share of them, I stand amazed at their temerity in venturing on the dope which we have administered to them in return. Yet weapons are only what men make them. The Corps which consisted of 800 officers and 9,000 other ranks in July, 1914, was developed to 16,000 officers and 132,000 other rank in 1919, and exceeded in numbers the original Expeditionary Force. Beyond these, thousands of busy practitioners attended hospitals for hours daily, refusing all remuneration, 18,000 V.A.D.'s gave their services in these hospitals for years together, and 2,000 masseuses, provided by the public spirit of Lord Queenborough, served under the direction of Miss French. Can you have a higher tribute to any Corps than that, the nation thus mobilized itself in its support? With these reinforcements, the Army Medical Corps, who having 2,000 patients in hospital in 1914, attended 577,000 in 1919, and, as early as July, 1916, received 48,000 patients in hospital in a single week. We owe it to the successive Heads of the Army Medical Department at home and abroad that these gigantic developments did not lead to hopeless confusion. Our Army was the only one of all the combatants which had to conduct six different expeditions at the same time. It would be strange if with the desperate gamble of the Dardanelles, the sudden stroke at Salonika, the mirage of Mesopotamia, all coincident with overwhelming claims in France, we had entirely avoided military miscalculations and consequent medical perplexities. But through these difficulties the Army Medical Department with their immense civilian retinue marched abreast forward to ultimate success.

"There sits upon my right to-night, as our chief guest, the man who typifies the administrative genius, the executive efficiency and the scientific skill which enables us to thank our guests, not merely for great service to the Empire, but for the position which they have won for Great Britain in the scientific world. Sir Alfred Keogh was the man who turned to account the reforms with which the names of Sir Frederick Treves, Sir Alfred Fripp and Sir Cooper Perry will be always associated. As Director-General he organized the Sanitary Science and Mobilization before the war. He was recalled to the highest responsibility for four fateful years, and wielded autocracy which only an Irishman can appreciate, and which even an American President might envy. He cornered the quinine of the world, and so deluged his subordinates with supplies that one of them inflicted thirty grains apiece a day on a whole division for a month. He engaged 20,000 of the civil practitioners of the country, and with the remaining 15,000 to look after 40,000,000 non-combatants he left Bath and Cheltenham sorrowing. He was never at a loss, whatever the emergency. I once heard Sir William Harcourt say that a minister could have no better title to fame than that he stood well with the House of Commons. It is due to Sir Alfred Keogh and to Sir John Goodwin, on whom his mantle has so worthily fallen, that we can pay the Army Medical Department the tribute that it stands well with the Army. When we associate with the toast Sir G. Makins—the President of the Royal College of Surgeons, we have the best representative of men who are so well known that military rank can add to them distinction only, but no eminence. We thank them that in the hour of their country's need they left the advantages and amenities of private practice and gave their talents and health at the expense of their pockets. The Medical Service have taken as their motto Kipling's well-hnown aphorism:—

'Only use your left hand to procure wealth;
'Keep your right for the proper work of life.
'For if you employ both arms in the game of acquiring wealth you will be in danger
'of stooping and losing your soul.'

"The victory of this country in the war was not won only by ships and armies, by guns and powder, but by the spirit and self-sacrifice of the British race, and it is to the Army Medical Department, as typifying that spirit, that we gratefully drink to-night."

The Rt. Hon. Winston Churchill: "Lord Midleton, my Lords and Gentlemen, you have invited me to add a few words to the eloquent and searching tribute in which my noble friend, our chairman, has proposed the Royal Army Medical Department, and the eminent civilians attached to it during the war. It was a very happy thought and a very true thought, of Lord Midleton and his friends to fix an occasion of exceptional importance, to gather together a great company like this, in order to celebrate the achievements of the Medical Services, military and civil, during the great war. Why should they be left out? Every form of national effort which produces the weapons and devices of destruction have been tributed and glorified, and those who have wielded those fearful weapons with such great effect have also received the honour which is their due, but there are those who, in equal danger and in equal hardship, have been saving life where all others have been taking it, have been healing wounds where all others have been inflicting them, are entitled in due course, in fitting season, to their meed of popular applause, and the tribute which is due to them from the people of the country for which they have toiled.

When this island nation of ours, with its Empire gathered about it, plunged into this extraordinary war suddenly it had to embark upon a vast expansion. Everything had to get fifteen twenty, thirty, forty times bigger than it was before, and for the first year or so of the war the, men who were right were those who thought far bigger than anybody else dared to think. Every branch, every aspect of our national life which had any relation to the war underwent this magnification, but in no branch was it more remarkable than that in which the bulk of those who are gathered here to-night were directly and honourably, and often with so much distinction, associated. I am told that there were 7,000 beds available when the war began, and there were nearly 700,000 beds, nearly all filled, when the war ended. That alone measures the expansion in bulk, in quantity, in numbers, which the medical science of Britain in a military garb was able to produce. You may take the Artillery, you may take the man-power, you may take the organization of explosives and so forth, you will not be able, merely from the standpoint of multiplication and magnification to find anything more remarkable than that. But there is more which you have a right to claim. There is another and a higher aspect. The improvement in the method of treating this great mass of suffering, misery and shattered figures that came pouring back upon the science and charity, science and mercy, and humanity of the British nation, underwent an improvement and an advance which well compares with the magnification, with the multiplication. And how much did all this matter to the millions of homes and the hundreds and thousands of men, in periods of the greatest human weakness and misfortune when they cast themselves upon the mercy of the Royal Army Medical Corps, and never found that mercy lacking. No one knows anything about this war who has not been in a large casualty clearing station six or seven hours after a great battle has begun. A more terrible spectacle, a spectacle more calculated to impress itself indelibly upon the mental retina cannot be conceived. And the only comfort, the only feeling of solace a whole and healthy man had when he saw the appalling misery pouring in in a ceaseless stream, ambulances rushing in in a ceaseless stream, disgorging their contents, was that everything that passionate humanity and sympathy could devise, and which science could execute, was at the disposal of those miserable heroic beings who lay scattered in those scenes of misery, while all the cannon was thundering and reverberating in the distance, which was a promise of future large supplies of misery pouring into the centre. I think it is just that Lord Midleton should claim that the Royal Army Medical Corps, in the formation of which he bore so distinguished a part, treated our soldiers, the soldiers of the British Empire, not only with the utmost effort and resources at their disposal, but on the whole achieved a better, a more humane, a more scientific, a more refined treatment than was arrived at by any other of the great nations that were engaged, and as deeply engaged, in the war as we were.

"It would be wrong for anyone to dwell upon the achievements of the Army Medical Corps without making the fullest acknowledgment of the immense services that were rendered by the eminent civilians who so truly and so generously and so blithely gave their services in this terrible time through which we have passed. The British medical science has no doubt gained enormously by the experience of this tragic time, and the Royal Army Medical Corps could not have achieved the great feats either in the domain of medicine or surgery, or in that of military hygiene which are upon record if they had not received this immense reinforcement from the finest scientific brains in the country devoted to the healing of wounds and suffering.

"I am very glad, indeed, Lord Midleton, after so many years have passed, when I was your critic, your youthful, ignorant and harsh critic, to sit at your side to-night and to thank you for the opportunity you have given me of supporting you in proposing this toast, and in making a recognition of your work in the organization of the Army following upon the Boer War, which subsequently proved when the next time came, as the next time has a knack sometimes of coming, to be in many important respects signally vindicated. I am very glad to sit by your side and join with you in recommending to this company the toast which you have with so much thought and care and earnest conviction proposed."

Field-Marshal, The Earl Haig, who was received with loud and continued cheers, said: "My Lord Midleton, my Lords and Gentlemen, I must first thank you with all my heart for the very friendly welcome which you have just given me. I must say I am very pleased to be here to-night, and very proud, and I feel greatly honoured to find myself associated with the two great orators who have spoken in proposing the toast.

"I speak as the late Commander-in-Chief of our Armies in France, and I know perfectly well that I express the opinion which they all hold when I thank the Royal Army Medical Corps and the eminent civilians attached to that Corps for all they did to help us to win the war. I cannot, it is impossible, exaggerate all we owe to them. Lord Midleton has given us many statistics. He showed us how we started with small beginnings. That carries my thoughts back irresistibly to the early stages of the war when the Expeditionary Force was very small indeed, when the circumstances under which we existed were very difficult, and when the work which the Royal Army Medical Corps had to perform was performed under very difficult circumstances. I looked up the other day a few notes that I had as General Officer Commanding the first Corps, of the work of the medical units attached to us during the fighting on the Aisne. The work was most difficult and exacting. The work of locating, dressing, and evacuating the wounded was carried out under very great difficulties. There were many wounded in the thick woods. There was continuous firing all day long, and they was sniping by night along the lines

of communication. It was our first experience of trench warfare, and our trenches were very poor compared with those that were made later on in the war. There were no lights in the trenches. One does not require to be a surgeon to know what that means in dealing with wounded. The field dressings at that time I see were pronounced to be insufficient. The wounded were conveyed back by horse ambulance to the Divisional Dressing Station, and then on in empty waggons of the supply column. Such a system was unsatisfactory from the medical point of view as well as from the supply point of view. We had no motor ambulances, ten were lent us by the kindness of the French. There were some twenty motor omnibuses put at our disposal. These facts will show you I think the tremendous difficulties which, at the outbreak of the war the Medical Services laboured under. The first Corps suffered from heavy casualities about the middle of September, 1914, when we forced the passage of the Aisne and took the Crayonne Ridge and established our Front on the Chemin des Dames, about which we heard so much later on in the war. The conduct of the Medical Corps was perfectly splendid, so unselfish and so devoted. We have nothing but the greatest praise for them. Some of us leaders realized that the success of the Army in the war depended very much on having an efficient Medical Service. At that time we viewed with great anxiety the expansion of the Army after our experience on the Aisne. As you know, I will say it at once, those anxieties had no cause for existence. As the Army grew the Medical Service grew and became most thoroughly efficient. The problem they had to deal with was a huge one. The constant fighting resulted in very heavy losses, losses far beyond anything estimated by the most knowledgeable people at the War Office. Those heavy losses threw a tremendous strain on the personnel of the Army Medical Corps. Yet everything worked smoothly. The wounded were evacuated rapidly and in the greatest comfort. The general comfort and excellence of our hospitals was quite wonderful. They were the admiration of all visitors who came to France. All ranks worked with the greatest devotion and gallantry. The Royal Army Medical Corps, the Field Ambulances and the Medical Corps of the Dominions all had heavy casualties and that demonstrates how zealously they all did their duty. The work of the Nursing Staff behind the Front was equally arduous. As time went on the enemy developed his aeroplanes and carried on a methodical system of night bombing. The conditions therefore were most dangerous, and yet the skill and devotion of all was far beyond any praise that I can give them.

"I would bear witness to the good feeling and confidence of the fighting portion of the Army in their medical comrades. I feel I personally owe a lasting debt to my two Directors of the Medical Service, to Sir Arthur Sloggett—and then latterly, for a short time to General Burtchaell—as well as to their deputies, Sir William Macpherson and General J. Thompson. The happiest relations existed between the Regular Royal Army Medical Corps, the Territorial Force, Medical Corps, and the civilian Medical Officers and Consultants. I think a very great debt of gratitude is due to my Director-General, Sir Arthur Sloggett, that that was the case. You all know how necessary it was that the civilian Medical authorities and the Army Medical authorities should work hand-in-hand. It is due to him, I think, that that close friendship and cordiality existed throughout the Army while he was there. The fact of those good relations contributed in no small measure to the success of the Medical Services as a whole, and consequently I maintain to the success of our Armies in the field. I cannot speak too highly of the immense help rendered to the Army by the eminent civilians, many of whom are with us here to-night; their untiring professional zeal is beyond all praise. I would like to mention the names of the two Senior Consulting Surgeons, Sir George Makins and Sir Anthony Bowlby, and also the names of the two Senior Consulting Physicians, Sir Bertram Dawson, now Lord Dawson, and Sir John Rose Bradford, and also Sir Wilmot Herringham. I do not forget my friend Sir Wilmot. I well remember in the midst of one fight calling in at a casualty clearing station and finding him there sitting with his sleeves rolled up doing what he could in a small way to help the surgeons because there was no occupation for him then. History will record by statistics how the enteric fever was stamped out by inoculation and by sanitary precautions—our Chairman has mentioned that—and history, too, will relate how the gas attacks of the enemy were rendered innocuous, thanks to the discoveries of our chemists and scientists. All our colleges and universities helped us. They all played the game like men. To-night, I thank them on behalf of the Army which I had the honour to command, and I especially express the gratitude of the Army to Sir Alfred Keogh. We were colleagues together at the War Office, and I had reason to be very grateful for the way he helped the General Staff—it is many years ago now—in working out the war organization for the Expeditionary Force which eventually went to France. I wish to express our gratitude especially to him for what he did to organize the Medical Services which he brought to such a successful conclusion. I beg to associate myself with this toast."

"The Toast of 'The Army Medical Department and the eminent civilians attached to it during the war, coupled with the names of Sir Alfred Keogh, Sir John Goodwin and Sir George Makins,' having been duly honoured,

Lieut.-Gen. Sir ALFRED KEOGH: "Lord Midleton, my Lords and Gentlemen, I use no mere figure of speech when I say that I am quite unable to find words to express my thanks for the singular and unprecedented honour which you have conferred to-night on the Army Medical Service, and in the Army Medical Service I include not only the officers, the nurses, the non-commissioned officers and the men of the Army, but the great civilian profession, and I should be glad if you would not exclude from that category the great Red Cross Society which in war

is an integral part of the Royal Medical Services of the Crown. I say I find it exceedingly difficult to find words to express the emotions from which we of those Services labour on such an occasion as this. When you come to consider that we have here to-night as our hosts eminent Ministers, soldiers of repute, and experienced administrators who come to give honour to us for the services which we have endeavoured to render to our country and to the Army to which we belong, I find it quite impossible to find any form of words which will adequately return to our hosts to-night an approciation of this extraordinary occasion.

"My Lords and Gentlemen, our hosts have given us a triumph to-night, a triumph after more than 60 years of endeavour on our part to become efficient. I say sixty years though I might indeed put it further back. Some of us here who are acquainted with the history of the Medical Services of the Army might perhaps put it back right to the time of the Peninsular War. Under my great predecessor, McGrigor, there appeared to be for a time, but only for a short time, some belief that the medical Service of the Army was going to pursue the path of progress which it later followed; but I put it at sixty years because it was then that we first saw the light. It was the great Lord Herbert who first inspired us, who, if people only knew it, should be called in this country the father of sanitation, the father of British hygiene, the first of all the systems of hygiene in this world. He was as I say our first inspirer. He gave us our great ideals, and pushed us along the path which through decade after decade of darkness and of trouble, we pursued, without any hesitation, amidst great difficulties and great troubles. I had the misfortune to live nearly forty years of that time when there was much misunderstanding. We were greatly misunderstood and we suffered accordingly. As I say, there were decades of complete darkness after the loss of that great statesman, Lord Herbert, but Providence, in His good time, at last gave us two statesmen, who saw what it was we were endeavouring to do. We believed, and we believed it with increasing fervour as time rolled on, as the stock of knowledge went on increasing, that stock of knowledge to which Pasteur and Koch, and our illustrious Bruce have contributed, that we could enable Commanders in the Field to win their campaigns and to fight their battles successfully, and through the exertions of our glorious Lister that we might be able to mitigate the awful horrors of war in some sense. But it was not to be until, as I say, God gave us two statesmen who understood us, who knew what it was we were endeavouring to do. The first of those statesmen was Lord Midleton who sits beside me. I had the privilege, I was then comparatively a young officer of the Corps, of being associated with him in the reforms which took place. We had subsequently Lord Haldane. Lord Haldane did splendid work for our Service, and through our Service of course for the Army, but what Lord Haldane did could never have been accomplished had not he had as a precursor Lord Midleton. Had Lord Midleton not been with us Lord Haldane would have had to begin where he (Lord Midleton) began. The whole programme which we for many years knew must be followed would have had to be begun years after Lord Midleton commenced it, and we should not have been in time for the great conflict from which we have just victoriously emerged. It is impossible for me in the time which is given to me to have the privilege of addressing you to tell you of all that Lord Midleton did. To begin with he accomplished what has not been accomplished in any profession with which I am acquainted. He gave us the opportunity of post-commission study, what in civil life is called post-graduate study. He arranged that officers of the Medical Branch of the Army, should, after their first tour of foreign service, undergo a further course of instruction just at the very time when they began to appreciate the opportunities which possibly they missed during their own student careers, by placing themselves in touch with modern science, with improvements which had taken place since they obtained their Medical Degrees. He had that courage—I say that advisedly—because there was much opposition—as there is always to anything new in this country—to establish the Royal Army Medical College in London. He thus placed us in touch with the civilian branch of our profession, which was the one thing we craved for. By placing us in that position he, without knowing it, though I think we saw it, produced those effects which have had, as you were kind enough to say, an important influence upon the various campaigns in which we have been recently engaged. The consequences of the removal of the College to London were both immediate and remote. Many of us thought that perhaps there would be consequences. The immediate consequences were those which of course must arise from the fact that our scientific men, Bruce and others of less repute, but of no less utility, should be thrown into the heart of science in London. Lord Midleton did many other things. He enabled us to reconstitute our units. Then there came Lord Haldane. God was good to us in giving us those two Statesmen. We were ready when Lord Haldane came to the War Office for still further development which we had also foreseen in due time. He enabled us to come into complete contact with our brothers in the civil profession. Let me say here that there are not two professions. There is only one profession. Those of us who adopt the Army as a career, as a matter of taste, are in no way different from those who persue their paths in civil life, not in any way different. There was no difficulty therefore in our joining with them in the great Territorial Service which Lord Haldane set up. Lord Haldane established the sanitary organization of the Army, that organization to which we owe so much. If the medical profession, with its kindred sciences, can prevent disease in war, that represents the military value of our services to the nation. The rest is humanitarian—but work of importance—not merely on account of the humanitarian qualities, but also, because, as I think the gallant Field-

Marshal will agree, men will not fight if they do not know with certainty that if they are hit they will be from that moment taken care of by the Medical people, and be nursed and treated as tenderly and as carefully as if they were in their own homes.

"My time is very limited. I am sure Sir Edward Ward is thinking that I have spoken quite long enough. I should like to say one word before I sit down about the organization which I have already mentioned—the Red Cross Society. I am one of those who believe that the Medical Service in the Army can never be efficient unless it is rolled up completely with the whole medical profession; and I believe also that it can never do its work properly in war unless there is a civil organization, which is a constituent part of the Medical Service of the Army, ready at once to take its place in the field when war breaks out. There were difficulties in the beginning of the war, which, however, were quickly settled through the agency of my friend, Sir Arthur Stanley, who is here to-night, and we owe a great debt to the work of the Joint Committee of the Red Cross Society and the Order of St. John. I must allude once more to a point which I have already mentioned, and that is with regard to the Territorial Force. Fortunately in that Force we had a number of officers who had already studied military medical administration, and who were prepared to give their services in the administrative work of this great Service, to whose agency alone I think it was possible to expand the Medical Corps into the size it became later on. Had it not been for those officers who had been instructed on the definite plan and definite principle, with which the gallant Field-Marshal was himself directly connected in those early days to which he has alluded, I do not think it would have been possible to expand our Service. The very expansion of the Service itself was due to Lord Midleton under whom the expansion of the Service to meet the needs of the war, as it was called at that time, was approved when it took the field in 1914.

"My Lords and Gentlemen, you have been kind enough to pay us this very high compliment. It will remain in the minds of us for the remainder of our lives. It will be spoken of and thought of and recorded in the history of the Medical Service for future generations. I would like to say that if you are good enough to think that we deserve well of our country we must remember that had it not been for the General Officers Commanding in the Field it would have been impossible for us to have done anything. We entered upon all campaigns with fear and trembling on account of the want of sympathy which existed in all wars in which we have been engaged, but from the beginning of this campaign we saw that things were changed. There was a younger generation of Commanders. Many of them had been engaged in work at the War Office during the period in which I, myself, was engaged in the organization of the Medical Service. The Expeditionary Force was, from our point of view, a thoroughly well-educated Army. It was educated in sanitary science. The Territorial Service was also a well-educated Service. It knew the causes of disease. It knew the methods of preventing it. None of those things would have helped, they would have been futile, had it not been for the fact that, for the first time in history, the Commanders in the Field, Commanders of the Armies, Corps, Divisions and Battalions cared for the health of their men. I need say no more. I am deeply touched by the extraordinary tribute which you have rendered us to-night. But, I should also like to say before I sit down that it was not only in the armies of France that all this work was done. We had campaigns in Salonika, Egypt, Palestine and the Dardanelles, and later on, though not as many people think, earlier, we had to take over the Mesopotamia campaign. All those things were thrust upon us at almost a moment's notice. Nothing could have been done in the Mediterranean area, we would have failed in that area had it not been for that gallant Field-Marshal who sits on my left, Lord Methuen. I often used to think in those days that Lord Methuen would probably complain of me, that he would probably say I was burdening him too much in the Island of Malta. You must remember there were three campaigns in that area. The Commanders were independent of one another; there was no co-ordinating authority; but Lord Methuen filled the position of a great co-ordinator. As far as we were concerned I burdened him over and over again with sick and wounded, but he never minded. I used to apologize to him through my letters, but he continued to say, 'Send me more, I will do anything you like.'

"I desire to thank you with all my heart for the extraordinary honour which you have done us in inviting us here to-night."

Lieut.-General Sir JOHN GOODWIN: "Lord Midleton, my Lords and Gentlemen, I find that there are two great disadvantages in speaking late in the evening: the first is that the pre-speech agony is prolonged, and the second is that previous speakers have said most of what one was going to say one's self.

"Whatever success the Royal Army Medical Corps may have had in the recent war—and it has been generously spoken of to-night—that success is due beyond question to three main factors. The first factor is the evolution and progress which took place in the Medical Service during the twelve years which elapsed between the South African War and the recent war. Not only I, but every officer and every man in the Royal Army Medical Corps will endorse all that Sir Alfred Keogh has said with regard to what Lord Midleton and Lord Haldane did for the Army Medical Service. We should never have been where we are, nor been able to do what we did but for them. Another great factor was the way in which the whole civilian profession came forward at the outbreak of the war, forsook and abandoned everything else and laid all their knowledge and ability, without question, at the disposal of the Nation and the Army. Lastly, I think a very important point is the very great change which took place during those years as

regards the relations between the Royal Army Medical Corps and the rest of the Army. We got to know each other so much better than had previously been the case; we became so much more in sympathy with each other; we learned such an enormous amount by working in close co-operation with other branches of the Army, by manœuvres and staff tours and lectures, and by many other means. We learned to understand and to know the working of the combatant Services; and I think—in fact I feel quite certain—that they also learned to know how to sympathize with the difficulties and to appreciate the objects and aims of the Medical Service. That had an enormous bearing in this war.

"We started in sympathy with each other, understanding each other's difficulties, and we understood the organization of the different Services more and more as the war went on. Well, I hope we have done our best in this war, but we must not forget that the very best that has been done in the last five years is not the best attainable, and that, as time goes on, as science advances, as knowledge progresses, we also must advance and progress. I honestly and firmly believe that we have, at present, the best Army Medical Service in the world. We must see that we maintain it so. It must remain the best, and consequently it must advance; it must maintain the position which it now holds, for, I think, no one will contend, for a moment, that our Service was not the best of the medical services in the recent war. We have learned a very great deal, but there is very much still to be learned, and we must steadily progress if we are to maintain our position, and if we are to be prepared for every contingency and eventuality which may arise in the future. Much has been said about the work of the Royal Army Medical Corps, but there are two points which have impressed me a great deal, and upon which I feel deeply. One is this—I believe myself that the conditions in England at present would not be as they are, that social unrest would be greater than it is were it not for the fact, at least I believe it to be the fact, that every soldier who has served in the war believes, and his relatives and the British public generally believe—and I think they have reason to believe—that honest endeavour was made throughout the war to prevent disease and to alleviate suffering, and that, speaking generally, the best was done for our sick and wounded. The second point is that which Sir Alfred Keogh has mentioned. There is now no question of the civil profession *and* the Royal Army Medical Corps. We have been one in this war, we have served together; we have been through trials and vissicitudes together; we have understood each other's difficulties and troubles; and we are now bound together in close sympathy, and not only will that union continue to be maintained in the future but I believe and I earnestly hope that it will, as the years go by, get stronger and stronger.

"I should like to say one word on a subject with which I was rather closely connected, and that is the amount which America did for the Medical Service, and also for the Army in this war. I was sent out to America on a mission just after that Nation came into the war. We were then in serious straits as regards shortage of medical and nursing personnel. I at once placed the whole situation frankly before the War Secretary, Mr. Baker, and before the head of the American Medical Service, General Gorgas. I cannot express to you the cordial way in which I was received, the sympathetic hearing which was accorded to me, and the generous response with which I met. General Gorgas, Mr. Baker, the American Army Medical Service, and not only they, but the whole medical profession of America, placed everything at my disposal, with the result that within a very few months over 1,000 American doctors and more than 700 nurses, equipped and uniformed by the American Army, were placed unreservedly, and without question, entirely at the disposal of the British Armies. Had it not been for the whole-hearted help afforded to us by America I hardly like to think what might have happened in 1918, owing to shortage of medical and nursing personnel in our Armies. My personal experience of the last two years has been somewhat varied. I may say that I entered upon my present post with the gravest trepidation and anxiety as to the possible failure of the Service on account of my shortenings. I can only say that throughout those two years I have served under two Adjutant-Generals, and with various members of the Army Council, I have received from them every possible support, help and guidance, and the most cordial sympathy has been extended to me at all times and in all places. I have never at any time felt that sympathy or support was wanting, I have also felt during the whole of that time that I had the entire civil medical profession with me and behind me, ready to help, support and counsel me. Without those two factors, and without the unswerving loyalty and untiring work which my own personal staff at the War Office invariably afforded me, I personally—I do not say the Service— but I, myself, must have failed lamentably. I have learned a great deal in the past two years, and a great deal that I knew before has been still more firmly impressed upon me. One thing of which I am even more firmly convinced than ever is that there is only one possible pathway through life, and that is the open highway. Another fact which I have learned is that it is absolutely impossible to please everybody; one is fortunate if one pleases even half the people; I think it was Goldsmith who said that if one wished to please one half of the people one had absolutely to ignore what the other half said or thought. There have been many difficulties in the last two years, and no doubt —indeed, it is inevitable—there will be many more difficulties in the future. I am not complaining of that for a moment, I do not think I would wish to have it otherwise, because, personally, though I may be wrong, I do not think a country is worth riding over if there are no fences. I firmly believe that the Royal Army Medical Corps has a very great future in front of it. I believe that it will advance in science, in professional work and attainments, and in admin-

istration, steadily, and I hope rapidly, so that if and when it is again called upon by the Army and the nation it may not be found wanting.

"I wish very much that I could express my thanks and the thanks of all of us for the very great honour which has been conferred on us to-night, for the immense compliment which has been paid to the Service. Sir Alfred Keogh tried to do so, and he succeeded far better than I could ever hope to do. I can only ask you to believe that, especially for an indifferent speaker like myself, it is the very subject on which one feels most deeply that one can speak the least, eloquently. I thank you all very much indeed."

Letter subsequently received from Lieut.-General Sir John Goodwin, K.C.B., C.M.G. D.S.O. :—

"War Office, Whitehall, S.W.1
"*June* 30, 1920.

DEAR SIR EDWARD.—I am feeling somewhat exercised with regard to a very grave omission from my speech at the dinner to the Royal Army Medical Corps on June 8.

"I had fully intended, after referring to the admirable manner in which the medical profession came forward on the outbreak of war, to draw attention to the fact that this spirit of loyalty and devotion was by no means confined to the medical profession.

"Throughout the war I felt strongly that an enormous amount of invaluable work was carried out by numerous voluntary organizations, which supplied innumerable articles in the way of clothing, stores, comforts and accessories not usually supplied from official sources. Had these numerous organizations, totalling an immense number, been working on independent lines, difficulties and overlapping would inevitably have resulted, but this was avoided by co-ordination and general administration so ably carried out by you and your staff.

"The amount of time and energy devoted to the subject must have been immense, it certainly resulted in a very greatly increased degree of comfort in our hospitals.

"The thanks of every hospital and of all patients are due to you, your staff and the voluntary organizations working under you for their untiring and devoted work.

"That I omitted to state this in my speech was a grave ommission on my part which I much regret, and which was due to my speaking towards the end of the evening, and my desire not to inflict my listeners with an unduly long peroration.

"Believe me,
"Yours very sincerely,
"T. H. J. GOODWIN."

Major-General Sir GEORGE MAKINS: "Lord Midleton, my Lords and Gentlemen, the responsibility has been placed upon me of responding for the eminent civilians who took part in the Medical Services during the war. I may say, first of all, that, of all the civilians, our lot was the most happy. We were called upon to take part in work which had been the occupation to which our whole lives had been devoted, and, therefore, we suffered no interruption in it. We gained advantages from the work which we were called upon to do. Again, I think we had great satisfaction, a satisfaction which we may express without any undue pride of feeling that we were bringing to the Army Medical Service a strength which raised that Service to a degree of efficiency which no army has ever had at its disposal before. If one is to ask for the explanation of the success with which the Regular Service and the temporary officers worked together, I think it is to be found at once in the spirit of mutual confidence which existed between us. I should like to say with regard to the development of this, that I think no member of the Service was more responsible than our friend, Sir Alfred Keogh. He first tried to arouse the spirit at an early period of his career when we met with him in South Africa. He fostered it during the whole of his term of office, and I hope and believe that it has now become a tradition of the War Office. During the war, we, in France, also owed no small debt to Sir Arthur Sloggett, who met us with open-hearted sympathy, gave us his confidence, and was ever ready to entertain suggestions likely to lead to good results from whatever source they might originate.

"I have to respond for the eminent civilians, and in a sense I am supposed to respond for the eminent surgeons. I should like at once to say that although the eminent surgeons have done great work, we owe a great deal to the junior members of the profession who form its rank and file, because those young men not only showed initiative but capacity to carry out their work and reached in a great measure their ideals. I have to respond also for the physicians. That is rather an odd position for me, but I would like to say that great as the triumphs of surgery were, the triumphs of medicine were equally great. I do not think in any former campaign so much advance was made in medicine as was made in this. The striking feature was that certain diseases were really traced from their origin to their end. I do not think that during any other war such achievement has been made. Then in speaking for my own profession I ought to add our thanks to various men who followed pure science. The advances which were made in medicine and surgery during the war depended on the help of a host of men; there were the chemists, the pathologists, the bacteriologists, and so on. Every one of those men took his part. There is no doubt that the practising surgeon and physician could never have achieved that which they did had it not been for the help of the students of pure science who came and collaborated with us and gave the whole of their knowledge and time to the subject.

"I should also say one further thing, especially to Lord Midleton, with regard to the success of the Medical Services. The success of the Service, as far as I am able to judge, and I have been in other campaigns before this one, depended upon the enlightened policy of the authorities at the War Office, and the Army Council. In no previous war were we, at any rate as civilians, provided with hospitals and equipment and the opportunity of spending as much money as we liked to ask for, as we had in this war. There is no question about it, that that was the first source of success which attended the work of the Medical Service. On the part of the eminent civilians I should like to express our gratitude and appreciation of the honour which is being paid to us to-night. But we owe a greater debt than that. We owe a greater debt of gratitude to the Army. We were taken out of the ruts of a somewhat monotonous life, a great advantage to the younger men starting their careers, we were taken to fresh countries, and we made hosts of friends, more perhaps than we shall make during the rest of our lives. I beg to thank you all most heartily on behalf of the civilians."

The Right Hon. The EARL OF MIDLETON: "Gentlemen, that concludes our evening. We can only finish it by thanking you all very much for your attendance here to-night."

Three cheers were called for and given for the Chairman.

The Right Hon. The EARL OF MIDLETON: "Gentlemen, your thanks are due really to Sir Edward Ward. He is the gentleman who has carried out the whole thing, and to whom we owe any success that there is in this entertainment to-night."

Three cheers were given for Sir Edward Ward.

The proceedings then terminated.

ROYAL ARMY MEDICAL CORPS MESS, LONDON.

All officers of the Royal Army Medical Corps and officers removed from the Corps and still retained on the Active List are Honorary Members of the Mess, and it is hoped that they will regard the Mess, where they will alwavs be welcome, as a temporary home in case of need.

BIRTHS.

MACPHERSON.—On July 4, 1920, at 8, Egliston Road, Putney, S.W., the wife of Lieut.-Col. J. G. D. Macpherson, Royal Army Medical Corps, of a son (John Duncan Graham).

WOOD—At Mount Kamala, Solon, Simla Hills, on July 2, 1920, the wife of Capt. G. H. Wood, Royal Army Medical Corps, of a son.

MARRIAGE.

WELLS—URQUHART.—At Dublin Street Church, Edinburgh, on June 23, 1920, Captai H. J. G. Wells, youngest son of Dr. and Mrs. Wells, Keith House, West Kensington, to Helen, youngest daughter of the late Mr. Andrew Urquhart and of Mrs. Urquhart, 4, South Inverleith Avenue, Edinburgh.

DEATH.

McCREERY.—On July 25, at Skerries, Co. Dublin, Benjamin Thomas McCreery, M.B., F.R.C.S.I., Lieut.-Col. Royal Army Medical Corps (retired pay), youngest son of the late James McCreery, of Fermoy, Co. Cork, in his 63rd year.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, Serle Street, London, W.C., not later than the 22nd of the month.

Major, arrived Egypt December, 1919, for tour, is willing to exchange to go to India coming trooping season; consideration required. Apply E., c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C. 2.

Captain (Temporary Major) R. A. Anderson, R.A.M.C., whose Indian Tour finishes in May, 1921, is willing to do a further half tour in India. Any Officer not desirous of coming to India who would like to exchange by arrangement, apply to Holt & Co., London.

Lieutenant Colonel near top of Foreign roster desires immediate exchange with an officer serving at home and not due to go abroad this trooping season. Reply stating terms to H. S. R., c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C. 2.

Major due for abroad trooping season 1921-22 is willing to exchange to go to India present season. State terms offered. Apply E. B. B., c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C. 2.

EX-OFFICER'S HOME AND TROPICAL KIT FOR SALE.—Height 5ft. 11 in., Chest 38 in. Full dress: frock coat, patrol, mess, 3 service, great coat, field boots, parade and mess Wellingtons, sword with 2 scabbards and knots. Tropical full dress: helmet, mess, 4 khaki drill, largest size helmet and uniform cases. Camp kit bag with bed, bath and mosquito net. All in excellent condition by T. W. Castle. Also pair lady's patent leather riding boots, size 5 with trees. Apply E. G. H. Cowen, Stafford House, Church Road, Sutton, Surrey.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "Journal of the Royal Army Medical Corps," 56, Cornwall House, Stamford Street, S.E. 1.

MANAGER'S NOTICES.

The Journal of the Royal Army Medical Corps is published monthly, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

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Cheques or Postal Orders for Subscriptions, etc., should be made payable to the "Hon. Manager, Journal R.A.M.C.," and crossed "Holt & Co.,"

All communications regarding subscriptions, etc., should be addressed to The Hon. Manager, "Journal of the Royal Army Medical Corps," War Office, Whitehall, S.W. 1.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels and Proceedings of the United Services Medical Society.

Any demand for *reprints, additional to the above*, or for excerpts, must be forwarded at the time of submission of the article for publication, and will be charged for at the following rates, and additional copies at proportionate rates:—

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JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

OCTOBER, 1920.

EXTRACTS FROM THE LONDON GAZETTE.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1.
July 12, 1920.

The announcement in the Supplement to the *London Gazette*, dated June 10, 1920 (No. 31936), appointing Temp. Lieut.-Colonel Ernest William White, M.B., Royal Army Medical Corps, to be a Commander of the Most Excellent Order of the British Empire, in substitution of the notification published in the *London Gazette* dated June 3, 1919, is cancelled, and the following notification substituted:—

The King has been graciously pleased to give orders for the following promotion in the Most Excellent Order of the British Empire, in recognition of valuable services rendered in connexion with the War: To be dated January 1, 1920.

To be a Commander of the Military Division of the said Most Excellent Order:—

Temp. Lieut.-Col. Ernest William White, O.B.E., M.B., Royal Army Medical Corps.

War Office,
July 13, 1920.

AMENDMENTS.

The following is the correct description of a Non-Commissioned Officer who has been awarded the Distinguished Conduct Medal:—

534460 Serjt. J. S. Harrington, 14th Field Ambulance, Royal Army Medical Corps. *London Gazette*, dated March 12, 1919.

AMENDMENTS.

The following are the correct descriptions of the undermentioned Warrant Officers, Non-commissioned Officers and Men whose names have recently appeared in the *London Gazette* for the award of the Military Medal or Meritorious Service Medal:—

London Gazette, dated June 3, 1919:—

France.

26007 Serjt. J. W. Waller, Royal Army Medical Corps (Gazetted as Walker).

London Gazette, dated June 3, 1919:—

Egypt.

44285 Staff-Serjt. F. E. Leach, Royal Army Medical Corps: 17699 Staff-Serjt. (Acting Serjt.-Major) C. Morrall, Royal Army Medical Corps (Gazetted as Morrell).

London Gazette, dated June 3, 1919:—

Salonica.

25230 Cpl. T. A. Wexted, Royal Army Medical Corps (Gazetted as Wixted).

London Gazette, dated June 3, 1919:—

Home.

28658 Temp. Serjt.-Major E. J. Downes, Royal Army Medical Corps (Gazetted as Downs); 5081 Temp. Serjt.-Major F. S. Parton, Royal Army Medical Corps.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,
July 16, 1920.

The King has been graciously pleased to give orders for the following promotion in, and appointment to, the Most Excellent Order of the British Empire, on the recommendation of the General Officer Commanding, British Military Mission, in recognition of valuable services rendered in connexion with Military Operations in South Russia. To be dated March 15, 1920:—

To be Officer of the Military Division of the said Most Excellent Order:—

Temp. Capt. John Marsters Mitchell, M.B., Royal Army Medical Corps.

War Office,
July 16, 1920.

The names of the undermentioned have been brought to the notice of the Secretary of State for War by Major-Gen. H. C. Holman, K.C.B., C.M.G., D.S.O., for valuable and distinguished services rendered with the British Military Mission in South Russia, dated March 15, 1920:—

Temp. Capt. J. M. Mitchell, M.B., Royal Army Medical Corps.
Capt. G. P. N. Richardson, Royal Army Medical Corps (Special Reserve).
Lieut.-Col. H. S. Roch, C.M.G., D.S.O., Royal Army Medical Corps.
Capt. (Temp. Major) F. C. Tibbs, Royal Army Medical Corps.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,
July 23, 1920.

The King has been graciously pleased to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire, in recognition of valuable services rendered in connexion with minor Military Operations within the Indian Empire (or in territories adjacent thereto). To be dated June 3, 1919, unless otherwise stated:—

To be Officers of the Military Division of the said Most Excellent Order:—

Capt. William Niven Greer, M.B., Royal Army Medical Corps (Special Reserve). (For valuable services rendered in connexion with Military Operations in Burma.)

Temp. Capt. David Vincent O'Malley, M.B., Royal Army Medical Corps. (For valuable services rendered in connexion with Military Operations in Burma.)

The names of the undermentioned have been brought to the notice of the Secretary of State for War, for valuable and distinguished services rendered in connexion with the Military Operations in the theatres of war specified, during the period June 1, 1918, to April 30, 1919. To be dated June 3, 1919:—

KUNI PUNITIVE OPERATIONS.

Capt. T. Fleming, Royal Army Medical Corps.
Capt. W. N. Greer, M.B., Royal Army Medical Corps (Special Reserve).
Temp. Capt. D. V. O'Malley, M.B., Royal Army Medical Corps.

India Office,
August 3, 1920.

The names of the undermentioned Officers, Non-commissioned Officer and Man, have been brought to notice for distinguished service during the operations against Afghanistan by General G. C. Monro, G.C.B., G.C.S.I., G.C.M.G., in his dispatch dated November 1, 1919. (Published in the Supplement of the *London Gazette*, dated March 15, 1920):—

COMMANDS AND STAFF AND MISCELLANEOUS.

Capt. A. G. Biggam, Royal Army Medical Corps.
Lieut.-Col. (Temp. Col.) H. P. W. Barrow, C.M.G., D.S.O., O.B.E., Royal Army Medical Corps.
Col. T. W. Gibbard, C.B., C.B.E., K.H.S., Army Medical Service.
Col. C. W. Profeit, C.M.G., D.S.O., Royal Army Medical Corps.
Lieut.-Col. and Brevet Col. (Temp. Col.) A. H. Safford, Royal Army Medical Corps.

Royal Army Medical Corps.

90439 Qmr.-Serjt. H. Greenwood.
40870 Pte. (Acting Serjt.) E. F. Satten.

MEDICAL SERVICES.

Royal Army Medical Corps.

Capt. H. S. Blackmore, Royal Army Medical Corps.
Capt. W. S. Birch, M.C., Royal Army Medical Corps (Special Reserve).
Capt. W. M. Dickson, Royal Army Medical Corps (Special Reserve).
Major T. S. Dudding, Royal Army Medical Corps.
Capt. D. Fettes, Royal Army Medical Corps (Territorial Corps).
Capt. J. B. Fotheringham, Royal Army Medical Corps.

Lieut.-Col. J. G. Gill, D.S.O., Royal Army Medical Corps.
Capt. (Temp. Major) C. H. H. Harold, Royal Army Medical Corps.
Major T. C. C. Leslie, Royal Army Medical Corps.
Capt. R. B. Myles, Royal Army Medical Corps.
Major A. A. Meaden, D.S.O., Royal Army Medical Corps.
Temp. Capt. R. W. Murphy, Royal Army Medical Corps.
Capt. G. S. Phillips, Royal Army Medical Corps (Territorial Corps).
Capt. F. H. B. Norrie, Royal Army Medical Corps (Special Reserve).
Capt. and Brevet Major C. Ryles, Royal Army Medical Corps.
Capt. W. J. D. Smythe, Royal Army Medical Corps.
Major C. S. Wallace, Royal Army Medical Corps.
Major H. C. Winckworth, Royal Army Medical Corps.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.,
August 3, 1920.

The King has been graciously pleased to make the following promotion in, and appointment to, the Most Exalted Order of the Star of India for services during the operations against Afghanistan. To be dated January 1, 1920:—

To be Additional Companion of the said Most Exalted Order:—
Major.-Gen. Harold Hendley, Indian Medical Service.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,
August 3, 1920.

The King has been graciously pleased to make the following promotions in, and appointments to, the Most Eminent Order of the Indian Empire for services during the operations against Afghanistan. To be dated January 1, 1920:—

To be Additional Companions of the said Most Eminent Order:—
Lieut.-Col. Harry Dixon Packer, Royal Army Medical Corps.
Temp. Lieut.-Col. John Francis Haswell, Royal Army Medical Corps.
Major Alexander Frederick Babonau, O.B.E., Indian Medical Service.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1,
August 3, 1920.

The King has been graciously pleased to give orders for the following promotions in, and appointments to, the Most Excellent Order of the British Empire, on the recommendation of the Government of India, for valuable services rendered in the Field in the Afghan War, 1919. To be dated January 1, 1920, except where otherwise stated:—

To be Commanders of the Military Division of the said Most Excellent Order:—
Lieut.-Col. (Acting Col.) Harold Boulton, M.B., Indian Medical Service.
Col. Percy Carr-White, M.B., K.H.P., F.R.C.S.
Lieut.-Col. James Geoffrey Gill, D.S.O., Royal Army Medical Corps.

To be Officers of the Military Division of the said Most Excellent Order:—
Capt. (Acting Lieut.-Col.) Phirozshah Byramji Bharucha, D.S.O., F.R.C.S., Indian Medical Service.
Capt. Herbert Stuart Blackmore, Royal Army Medical Corps.
Major Cecil Edward Bulteel, Indian Medical Service.
Major (Acting Lieut.-Col.) Alexander Cameron, M.B., Indian Medical Service.
Temp. Capt. Pascal John de Sousa, Indian Medical Service.
Temp. Lieut. Bhola Nath Gupta, Indian Medical Service.
Capt. (Acting Lieut.-Col.) John Patrick Huban, M.B., Indian Medical Service.
Temp. Capt. Robert Walpole Murphy, M.D., Royal Army Medical Corps.
Capt. Robert Boulton Myles, M.B., Royal Army Medical Corps.
Capt. Forster Heddle Brown Norrie, M.B., Royal Army Medical Corps (Special Reserve).
Temp. Capt. Aiyappen Padmanabha Pillay, Indian Medical Service.
Capt. and Brevet Major Charlie Ryles, M.B., Royal Army Medical Corps.

To be Member of the Military Division of the said Most Excellent Order:—
Temp. Capt. Yashwan Bhicajee Ranade, Indian Medical Service.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W. 1,
August 3, 1920.

The King has been graciously pleased to give orders for the following appointment of the Most Excellent Order of the British Empire, on the recommendation of the Government of India, for valuable services rendered in connexion with the Afghan War, 1919. To be dated January 1, 1920:—

To be Officer of the Military Division of the said Most Excellent Order:—
Major (Acting Lieut.-Col.) William Walker Browne, Royal Army Medical Corps.

War Office,
August 3, 1920.

The King has been graciously pleased to approve of the undermentioned rewards, on the recommendation of the Government of India, for distinguished service in the Afghan War, 1919. To be dated January 1, 1920.

To be Brevet Lieutenant-Colonel:—
Major R. S. Kennedy, D.S.O., M.C., M.B., Indian Medical Service.

To be Brevet Majors:—
Capt. G. A. Blake, M.B., Royal Army Medical Corps.
Capt. (Temp. Major) T. A. Hughes, M.B., Indian Medical Service.

AWARDED THE DISTINGUISHED SERVICE ORDER.

Capt. and Brevet Major (Temp. Major) Eric Edward Doyle, Indian Medical Service.

AWARDED THE MILITARY CROSS.

Capt. James Edwin Carpenter, Royal Army Medical Corps, Special Reserve, attached 28th Mounted Ambulance Convoy.

Capt. Denis FitzGerald Murphy, M.B., Indian Medical Service.

ARMY MEDICAL SERVICE.

Col. (Temp. Brig.-Gen.) W. W. O. Beveridge, C.B., C.B.E., D.S.O., M.B., late Royal Army Medical Corps, is appointed Hon. Physician to The King, *vice* Major-Gen. S. Macdonald, C.B., C.M.G., retired pay, dated June 18, 1920. (Substituted for the notification in the *Gazette* of July 20, 1920.)

ROYAL ARMY MEDICAL CORPS.

Lieut.-Col. and Brevet Col. John M. Sloan, C.M.G., D.S.O., to be Temporary Colonel, from January 16, 1917, to February 4, 1919, inclusive.

Lieut.-Col. Horace S. Roch, C.M.G., D.S.O., to be Acting Colonel, dated October 12, 1919.

Lieut. Alexander Macdonald Simson, M.B., from Territorial Force Reserve (Artillery), to be Lieutenant, dated July 15, 1920, with precedence next below C. A. Hutchinson.

Major and Brevet Lieut.-Col. Henry J. Crossley, C.I.E., relinquishes the acting rank of Lieutenant-Colonel, dated February 14, 1920.

Major Theodore F. Ritchie, D.S.O., M.B., retires on retired pay, dated August 18, 1920.

Temp. Capt. Hugh Stewart Moore to be Captain, April 8, 1919, but not to reckon for pay or allowances prior to July 1, 1920, with precedence next below W. L. Partridge.

Major Ernest G. Ffrench, M.D., F.R.C.S.Edin., retires on retired pay, August 20, 1920, and is granted the rank of Lieutenant-Colonel.

Capt. John Rollo Hayman, from Special Reserves, to be Captain, dated March 10, 1918, but not to reckon for pay or allowances prior to June 1, 1920, with precedence next below G. D. Harding. (Substituted for the notification in the *Gazette* of July 9, 1920.)

Capt. David Fettes, M.B., late Temporary Captain, Royal Army Medical Corps, to be Captain, dated January 18, 1919, but not to reckon for pay or allowances prior to July 14, 1920, with precedence next below G. O. F. Alley.

Capt. Harold J. Bower resigns his commission, dated August 21, 1920, and retains the rank of Captain.

Temp. Capt. William Daniel Arthur to be Captain, dated February 15, 1918, but not to reckon for pay or allowances prior to July 1, 1920, with precedence next below R. C. Aitchison.

Temp. Capt. Michael James Whelton, M.B., to be Lieutenant and to be Temp. Captain, dated November 13, 1918, but not to reckon for pay or allowances prior to June 1, 1920, with precedence next below L. Handy.

The date on which Temp. Capt. Robert C. Begg, M.C., M.B., relinquished his commission is March 9, 1919, and not as in the *Gazette* of April 14, 1920.

Temp. Capt. Malcolm Frank Dougless Graham to be Lieutenant, and to be Temp. Captain, dated August 11, 1919, but not to reckon for pay or allowances prior to July 1, 1920, with precedence next below W. Y. Eccott.

Temp. Capt. Edward John Mannix, M.B., to be Captain, dated November 17, 1919, but not to reckon for pay for allowances prior to August 1, 1920, with precedence next below P. G. Russell.

Temp. Capt. Nicholas Purcell, M.B., relinquishes his commission, dated March 27, 1920, and retains the rank of Captain.

Temp. Capt. John T. Bleasdell relinquishes his commission, dated May 31, 1920, and retains the rank of Captain.

Temp. Lieut.-Col. John Robert Lord, C.B.E., M.B., relinquishes his commission on ceasing to serve with the Horton (County of London) War Hospital, dated July 19, 1920, and retains the rank of Lieutenant-Colonel.

The undermentioned to be Acting Majors :—

Dated March 3, 1919.—Capt. Henry R. L'Estrange, O.B.E.

Dated June 12, 1919.—Temp. Capt. Ewen G. M. Gilchirst, M.B.; Temp. Capt. Duncan Miller, M.B.

Dated August 21, 1919.—Temp. Capt. Arthur H. Greg, O.B.E., M.B., F.R.C.S.

Dated December 15, 1919.—Capt. Alexander L. Aymer, M.B.

The undermentioned Captains relinquish the Acting rank of Major :—

Dated March 1, 1920.—William McM. Chesney, M.C., M.B.

Dated April 1, 1920.—Alexander L. Aymer, M.B.

Dated May 5, 1920.—Hugh G. Robertson, O.B.E., M.B.

Dated May 13, 1920.—Harry C. Todd, M.B.

Dated June 22, 1920.—Frederick P. Rankin.

Dated October 1, 1919.—Henry R. L'Estrange, O.B.E.

The undermentioned Majors relinquish the Acting rank of Lieutenant-Colonel :—

Dated December 28, 1919.—Thomas H. Scott, D.S.O., M.C., M.B.

Dated April 1, 1920.—Brevet Lieut.-Col. John M. H. Conway, D.S.O., F.R.C.S.I.

Dated May 20, 1920.—Gerald H. Stevenson, D.S.O., M.B.

The undermentioned Temporary Captains relinquish the Acting rank of Major :—

Dated April 3, 1920.—Arthur H. Greg, O.B.E., M.B., F.R.C.S.

Dated April 16, 1920.—Daniel Gillepie, M.D.

The undermentioned Temporary Captain relinquishes his commission :—

Dated May 31, 1920.—William L. English, M.B.

The undermentioned Temporary Captains relinquish their commissions and retain the rank of Captain :—

Dated July 20, 1920.—Richard J. Monahan, M.D.

Dated July 28, 1920.—Malcolm J. Wilson, M.B.

Dated August 1, 1920.—Cyril A. B. Horsford, M.D., F.R.C.S.

Dated September 16, 1918.—Richard J. Aherne, M.C.

Dated July 15, 1920.—Charles E. Hibbard.

Dated July 21, 1920.—Leonard H. Woods.

Dated July 23, 1920.—David Mitchell.

The undermentioned late Captains, Royal Army Medical Corps, Special Reserve, to be Temporary Captains :—

Dated April 1, 1920.—David Bell Robertson, M.B., with seniority from November 1, 1917; Harold Awbery Hill, with seniority from June 3, 1919; William Henry Simmons, with seniority from November, 1919.

Dated April 19, 1920.—Douglas Ethelbert Hearn, with seniority from September 27, 1918.

SPECIAL RESERVE OF OFFICERS.

Royal Army Medical Corps.

Capt. Cecil J. Rogerson, M.C., M.B., relinquishes the acting rank of Lieutenant-Colonel, dated March 3, 1920.

Capt. Thomas C. Storey, M.C., M.B., relinquishes the acting rank of Major, dated February 16, 1920.

The undermentioned Captains to be Acting Majors :—

From January 4 to August 13, 1918, inclusive.—Edwin Butler; William Dunlop, O.B.E., M.B.

Capt. Ivan L. Waddell resigns his commission, dated August 11, 1920, and retains the rank of Captain.

NOTES FROM WOOLWICH.—The annual outing of the Serjeants' Mess members and their friends (a party of fifty), took place last month.

Travelling by train from Woolwich to Staines, they embarked on the steamer *Empress of India*, and proceeded up the River Thames to Boulter's Lock. There races were held for the children, prizes being generously given by Lieut.-Col. R. Tilbury Brown, C.M.G., D.S.O., M.D., Royal Army Medical Corps, Officer Commanding Royal Herbert Hospital. Luncheon and tea were served on board and a highly enjoyable day was spent. An excellent Concert Party accompanied them and contributed largely to the pleasure of all, especially to the younger folk.

The arrangements were in the capable hands of Serjt.-Majors Hughes and Sproule and Staff Serjt. Lewis, to whom the greatest credit is due.

Amendment.—In July's issue, giving the account of the football match, our opponents should read as Royal Army Ordnance Corps.

The small amount of money realized as a parting gift to the late Depot Serjeants' Mess Cook, Pte. J. Papworth, Royal Army Medical Corps, on the completion of forty-eight years' service,

thirty-four years of which were served as the Depot Mess Cook, is regretted by the members of our Serjeants' Mess. It is hoped that a further effort will be made to obtain a more substantial sum.

NOTES FROM NO. 8 COMPANY, ROYAL ARMY MEDICAL CORPS, YORK.—Major Johnson writes :—

At a general meeting of Officers, W.O.s, N.C.O.s and men at the Headquarters of the Company, it was decided to run a cricket side representing the Company, but as the personnel was a shifting population owing to demobilization, discharges, etc., to arrange a not too ambitious programme of fixtures. A practice pitch was prepared and arrangements were made to use the Garrison Ground at Strensall for home fixtures.

Our first match was arranged, and resulted in a draw owing to rain. Our opponents were Acomb, which team had the local reputation of being useful. Capt. Franklin won the toss for our side but decided to put Acomb in to bat.

Qmr.-Serjt. Mayo, Serjt. Ince, and Pte. Stell bowled well and were backed up by excellent fielding, with the result that Acomb were dismissed for 100 runs. Our side were 8 runs for 1 wicket, Major McGrigor being well caught from a big hit, when rain came down and put a stopper on the proceedings. Serjt. Ince had the good bowling analysis of 5 for 54 and Stell 3 for 15. Our first match gave us confidence, and we felt that with our excellent bowling and keen fielding we should have a measure of success.

Our second match was against "A" Company, 1st West Yorks, on June 9. Having won the toss our side hit up 76, of which Qmr.-Serjt. Mayo, batting excellently, compiled 21; Staff-Serjt. King and Pte. Fowler each contributed 16. Our opponents were dismissed for 62, Serjt. Ince having the fine analysis of 6 for 21, and Qmr.-Serjt. Mayo 4 for 15. Ince's slow left hand breaks were most effective.

Our third match was played on the Garrison Ground against the Depot West Yorks, and resulted in a substantial win for the Company. The weather was fine and the team was well supported by the wives and families of Officers, W.O.s, N.C.O.s and men. Capt. Franklin and Qmr.-Serjt. Mayo carried the score to 32 for the first wicket, and Stell, Salmon, and Cpl. Lafolley backed up Qmr.-Serjt. Mayo, who played a splendid innings of 63. His placing on the on side was especially clever; having carried the score to 156 for 9 wickets, Capt. Franklin put the Depot into bat. Stell, Ince and Mayo backed up by keen and close fielding dismissed the Depot side for 65.

SCORE.

No. 8 Company, R.A.M.C.		*Depot, West Yorks.*	
Capt. Franklin, c. and b. Waller	15	Serjt. Waller, c. Franklin, b. Ince	5
Qmr.-Serjt. Mayo, c. Riley, b. Waller	63	Serjt. Mawar, b. Stell	0
Pte. Stell, c. Savage, b. Waddington	15	Coy.-Serjt.-Major Jacobs, c. Salmon, b. Ince	9
Serjt. Ince, c. Jacobs, b. Waller	9	Serjt. Riley, b. Ince	8
Pte. Salmon, c. Irwin, b. Waller	17	Pte. Walker, b. Stell	7
Lieut.-Col. M. Swabey, c. Irwin, b. Waller	1	Lance-Cpl. Savage, b. Mayo	17
Cpl. Lafolley, not out	13	Pte. Waddington, b. Mayo	0
Staff-Serjt. King, b. Riley	0	Coy.-Serjt.-Major Irwin, c. Mayo, b. Stell	3
Capt. Browne, c. McLean, b. Riley	4	Pte. Ryan, stumped Salmon, b. Mayo	5
Pte. Coad, b. Riley	0	Coy.-Serjt.-Major McLean, not out	6
Serjt. Barton, not out	5	Serjt. Rutherford, b. Stell	0
Byes	14	Extras	5
Total for 9 wickets	156	Total	65

Bowling.

Stell	4 wickets for 23.
Ince	3 ,, ,, 30.
Mayo	3 ,, ,, 7.

Our fourth match was against York Y.M.C.A., and resulted in an easy win. Our side batted first and scored 76, of which Ince by steady batting contributed 26 and Salmon hit well for 20. The Y.M.C.A. were dismissed for 28, Ince obtaining 6 wickets for 16 runs and Mayo 4 for 11.

Our fifth match was against York Co-operative Society and resulted in an easy win, the Y.C.S. being dismissed by Ince and Mayo for the poor score of 18. Our team replied with 19 for 3 wickets; Mayo had 6 wickets for 4 runs.

In our sixth match *v.* Escrick Park we suffered our first and only defeat up to the present. We were not up to full strength on this occasion, which might partially account for the result. Escrick Park batted first and totalled 57. Qmr.-Serjt. Mayo and Serjt. Ince again putting up a fine bowling performance, Mayo took 5 for 28 and Ince 4 for 21. It looked odds on our winning

this our hardest match, but apart from Mayo, who scored 12, our batting broke down badly and the side was dismissed for 39. In spite of our defeat it was an enjoyable day's outing; we played on a perfect ground amid delightful surroundings; the wives and families who accompanied the team voted it most enjoyable.

Our seventh match was spoilt by the weather. Capt. Franklin, Qmr.-Serjt. Mayo, and Pte. Grace batted in the rain for over half an hour, totalling 23 for 1 wicket, when heavy rain set in and the match was abandoned.

Our eighth match was against the Royal Army Service Corps, whom Mayo and Ince dismissed for the poor total of 29. We replied with 105, of which Mayo made 10 and Pte. Grace 24. Mayo had the fine bowling average of 6 for 11 and Ince 3 for 14.

R.A.S.C. AT YORK.

R.A.S.C.		*No. 8. Company, R.A.M.C.*	
Chisnall, b. Mayo	2	M. Swabey, b. Rankin	25
Dooley, b. Mayo	5	Mayo, c. Bourne, b. Clarke	10
Harrison, b. Mayo	2	Grace, run out	24
Bourne, run out	7	Ince, l.b.w., b. Woodcock	8
Fogge, b. Ince	1	Regt. Serjt.-Major Pugh, c. Bourne, b. Clarke	0
Rankin, b. Mayo	1	Lafolley, l.b.w. b. Dooley	5
Clarke, b. Ince	0	Lieut.-Col. Swabey, b. Dooley	5
Severs, c. Grace, b. Mayo	3	Pte. Coad, not out	8
Dennett, not out	4	Tomlinson, c. Bourne, b. Dooley	1
Woodcock, b. Ince	0	Kaye, b. Bragg	5
Bragg, b. Mayo	1	Price, c. Bragg, b. Dooley	7
Byes	3	Extras	12
Total	29	Total	105

Our ninth match was played at Leeds against the Ministry of Pensions Hospital, Beckett Park, and resulted in another win. 8th Company batted first. The first wicket, Capt. Franklin and Qmr.-Serjt. Mayo carried the total to 22 before Mayo put his legs in front and retired. Grace and Capt. Browne put up a good defence on a difficult wicket and our total was 75. The Pensions people put on 30 for 2 wickets when tea interval was taken. Subsequently a remarkable collapse occurred. The third wicket fell at 30, the fourth, fifth and sixth at 31, and the whole side was dismissed for 37, Mayo taking 7 wickets for 15 and Stell 3 wickets for 2 runs.

SCORE AND ANALYSIS.

R.A.M.C.		*Pensions Hospital.*	
Capt. Franklin, c. Sub, b. Elwell	33	Capt. Scott, c. Stell, by Mayo	16
Qmr.-Serjt. Mayo, l.b.w., b. Elwell	10	Ramsbottom, b. Mayo	7
Stell, b. Elwell	0	Farrow, b. Mayo	4
M. Swabey, b. Elwell	0	Elwell, b. Mayo	0
Grace, run out	11	Pich, b. Stell	0
Lieut.-Col. Swabey, b. Elwell	0	Dr. Fleming, b. Mayo	3
Regt.-Serjt.-Major Pugh, c. Ramsbottom, b. Elwell	2	Dudley, b. Mayo	0
Capt. Browne, c. and b. Elwell	7	Sherburn, b. Stell	1
Butler, b. Elwell	1	Garnett, not out	2
Lafolley, not out	5	Monkman, b. Mayo	0
Extras	5	Sheldon, b. Stell	0
		Extras	4
Total	74	Total	37

So far we have played 9 matches, won 6, lost 1 and drawn 2.

CORPS NOTES FROM RAWALPINDI, PUNJAB, INDIA: Capt. T. I. Dunn writes:—

During the month of July the event of great interest to the officers of the Corps here was the arrival of a party of Royal Army Medical Corps rank and file, who have just come out from home and form part of the first draft of Royal Army Medical Corps men who have ever been posted for duty in India as permanent establishment. This party consisted of: Serjt.-Major T. J. Jarvis; Temp. Qmr.-Serjt. W. Davey; Serjts. J. McEnaney, W. Stewart; Cpl. Millgate and twelve privates.

This is truly a great event in the annals of the Corps, and the officers welcomed the arrival of this contingent with the greatest pleasure, and felt proud that the men of the Corps will now be represented in the work and play of the station, and look to the future to show great results by this new departure. No doubt it will be some time before all the nursing orderlies of the British Station Hospital will be furnished from the Royal Army Medical Corps; but if that

time should come, we shall record on the departure of the regimental orderlies our appreciation of the admirable manner in which they performed their nursing duties in the past, and of the important part they played in the successful care of the sick and wounded in the hospitals in India.

As we hear that other parties will be sailing for India from time to time, it will be of general interest to give the rough details of the voyage out to India, and the incidents which happened before the party of Royal Army Medical Corps men now in Rawalpindi were posted to this station.

The detachment, of which the Royal Army Medical Corps now here were only a part, sailed rom England on March 19, 1920, by the s.s. "Huntsend," and after an enjoyable voyage via the Bay of Biscay, Gibraltar, and the sunny waters of the Mediterranean, the vessel stopped for a few hours at Port Said. As there was ample provision of fans and the modern conveniences for voyaging in a hot climate, the heat experienced in the Suez Canal and the Red Sea—although trying, of course—was by no means excessive.

During the voyage the usual deck sports of all sorts were played, and a boxing contest took place in which one of the men of the Royal Army Medical Corps showed excellent form by winning the light-weight boxing event.

The Port of Bombay was sighted on April 13 with great interest by the troops on board, who disembarked that day, and then entrained, leaving Bombay en route for Deolali, which was reached on the morning of the 14th. There in Deolali the men went through a "Refresher Course" in Corps training. On completion of this, the party posted for duty in Rawalpindi left Deolali on July 8, full of keenness to commence their Royal Army Medical Corps duties in their first station in India. Their arrival here, July 10, marks a red letter day in the medical history of this station—the Aldershot of Northern India.

Since the arrival of the Royal Army Medical Corps contingent, a station hospital football team has been formed, comprising regimental and Royal Army Medical Corps orderlies. This team has played three preliminary matches to test the strength of the players with a view to entering for the local leagues, and it is encouraging to report that the hospital team was successful in these three games against the Battery football teams of the 29th Brigade R.F.A.

As a great number of the Royal Army Medical Corps officers who have served in India have visited, or stayed in the Corps Mess in Rawalpindi, it will be of general interest to let them know how their old Mess is progressing. No doubt the memories of happy times spent in the Mess here will be recalled by this remark: memories of winter nights when round the large glowing fire in the Mess ante-room, the best of good fellows met at the end of the day's work and games; memories of those summer nights with dinner on the lawn, after the intensity of the heat of the day had spent itself; when a cool breeze from the Murree Hills blew gently through those fine old trees in the Mess garden, which appears so beautiful when by night it is bathed in the moonlight of the East. Yes, this "Land of Regrets" has its charms.

The Mess, like most Messes during the war, lapsed into a state of disrepair, as towards the end of the war it was not possible to have repairs carried out. The Mess has now greatly improved in appearance, inside and outside, and every available rupee has been spent on repairs to the building, furniture and furnishings generally.

Donors of heads, masks and horns to the Mess will be glad to know that these have been thoroughly renovated in the last six months, and look very handsome as they adorn the walls of the hall, ante-room and dining hall. Most of the personnel of the Mess has changed; but old members will remember the Mess Abdar, Abdallah Khan, who on guest nights still looks as handsome as of old with his breast covered with the medals he won many years ago. The Khidmatgar Akbar Shah is now butler, and Khitmatgar Rhoshan is second butler. Allah Din, the faithful Chuprassi, who has served in the Mess for over fifteen years, is still active. Many members of the Mess will regret to hear of the death of the Mess Babu, Dinshaw, who was for a long time with the Mess in which he worked so well. In the spring of 1918 Dinshaw was knocked down on the Mall by a motor car and succumbed to his injuries. The hon. secretary of the Mess for the last year has been Capt. T. I. Dunn, D.S O., M.C.

Due to the aftermath of the war the personnel of the officers on duty in the station has altered very rapidly and it is not possible to mention everyone who has been here in the last year.

The D.D.M.S. Northern Command is Major-General C. C. Manifold, C.B., C.M.G., late I.M.S., and the D.A.D.M.S. is Major J. Turnbull, D.S.O., R.A.M.C. Capt. W. B. Allen, V.C., D.S.O., M.C., R.A.M.C. is at present attached to the Northern Command Headquarters for duty. Col. E. W. Slaytor C.M.G., D.S.O., is A.D.M.S. of the 2nd Rawalpindi Division, and is at present acting for Major-General Manifold, who is on leave in Kashmir.

A short time ago Lieut.-Col. Brian Watts, D.S.O., R.A.M.C., who was temporarily A.D.M.S. 2nd Rawalpindi Divisional Area, proceeded to Ranikhet to take up duties of A.D.M.S. of the Bareilly Brigade. We were all sorry when he left us. The A.D.M.S. of the 2nd Rawalpindi Divisional Area is Col. W. E. Hudleston, C.M.G., C.B.E., D.S.O., whom we are glad to see back again looking very fit indeed after his illness of last summer.

Major A. H. H. Emerson, D.S.O., R.A.M.C., is D.A.D.M.S. (San.), Major A. Hood, R.A.M.C., is D.A.D.M.S. (Mob.), and Major E. C. Beddows, M.C., R.A.M.C. is employed in this office as a D.A.D.M.S. Major J. Smalley, I.M.S., is D.A.D.M.S. (Distrib.).

Lieut.-Col. F. S. Irvine, C.M.G., D.S.O., R.A.M.C., is Officer Commanding British Station Hospital, and the Senior Medical Officer in the station. Since his arrival the Mess has benefited by his wide experience in the past in running the main Royal Army Medical Corps Messes at home, such as Millbank and Aldershot.

With the arrival of the hot weather the majority of the officers of the Corps were distributed for duty in the Murree Hills. Lieut.-Col. C. D. Myles O.B.E., R.A.M.C., is commanding the British Station Hospital in Murree, and the other officers now in the hills are: Major C. G. Thomson, D.S.O., Major J. H. Barbour, Capt. H. C. D. Rankin, O.B.E., Capt. R. Ellis, M.C., Capt. D. C. Monro, Capt. G. P. Kidd, M.C., Capt. H. D. Lane, M.C., Capt. W. K. Campbell, D.S.O., M.C., Capt. L'Estrange, Capt. W. E. Hodgkins, Capt. C. W. Randall (Dental Surgeon).

The unfortunates who have remained on the plains in Rawalpindi for the hot weather are: Lieut.-Col. F. S. Irvine, C.M.G., D.S.O., Capt. F. C. K. Austin, Capt. T. I. Dun, D.S.O., M.C., Capt. G. A. Bridge, M.C., Capt. E. S. Cuthbert and Capt. F. R. H. Mollam, M.C.

There are rumours that Refresher Courses for junior officers of the Corps in India are shortly to be resumed in Rawalpindi, and officers will be glad to brush up their knowledge of tropical medicine and learn many things which, due to the advent of the war, they have had very little opportunity of studying. Owing to the constant change of officers in the station and the difficulty in arranging sports and games on a permanent peace basis, few matches have been played in the last year. The Corps lost a fine sportsman out here when Capt. J. L. Ritchie, R.A.M.C., proceeded to England, as he was a leader in all games, and last year was Captain of the Rawalpindi Club Cricket Team. Last year the Peshawar "Medicals" came down to Pindi and played the Rawalpindi "Medicals" in a two days' cricket match which ended in a victory for the home team. This year Major E. C. Beddows, M.C., R.A.M.C., won the Rawalpindi Championship Golf Cup, and afterwards presented this silver cup to the Mess.

Last spring the officers of the Royal Army Medical Corps, Rawalpindi, were "At Home" on the first day of the great North India Horse Show, which was held in Topi Park. There was a large turnout of the society of the station and the Show was a great success.

We are all very glad that leave may now be looked forward to with some degree of certainty, and two officers from Rawalpindi have managed to get away for a short time. As we are literally at the gateway of Kashmir with its charm of scenery and sport by mountain and by lake, everyone is keen not to miss the chance of visiting it if possible, and those back from a month's leave have told of a most excellent holiday spent there. The cost of travelling to Kashmir is considerable, as Rs. 225 is charged for a car from Rawalpindi, but the cost of living and journeying after arrival in Kashmir is not really high. The bane of Kashmir is the "Boxwallah Cheap John," who appears at every hour of the day and dogs the footsteps of the "Sahib Log" with his importunate cries to buy his many coloured wares and wood carvings—but this is only a small item in the events of the day when holiday-ing in that Land of beauty—Kashmir.

I hope to communicate such items of Rawalpindi news from time to time as may be of interest to members of the Corps.

THE SECOND INTERNATIONAL CONGRESS OF COMPARATIVE PATHOLOGY.

To be held in Rome in April, 1921.

The following letter having reached me, after my visit to Rome in April, 1920, I take this means of making its contents known to those desiring to participate in the work of the Congress.

The Italian Committee of Organization has adopted the French language for all foreign correspondence and printed matter concerning the Congress.

"*Rome*,
"1er juin 1920.

"Monsieur et très honoré Confrère.—Les Congressistes réunis à Paris en Octobre 1912 pour le Ier Congrès International de Pathologie Comparée ont désigné la ville de Rome pour siège du IIème Congrès.

"A la suite de la guerre ce Congrès, qui devait se tenir en 1914, a dû être renvoyé; le Comité d'organisation a maintenant établi que le IIème Congrès International aie lieu dans le prochain printemps du 1921.

"Puisque vous avez contribué avec autant d'autorité que d'activité à la bonne réussite du Ier Congrès International de Pathologie Comparée, il est tout naturel que nous osions nous adresser à vous, et vous prier de prendre l'initiative pour organiser dans votre pays un Comité National. Nous espérons que cette tâche ne vous donnera pas trop de peine, et que vous pourrez faire connaitre au Secrétariat Général les noms des savants qui en feront part, ainsi que ceux de vos compatriotes à qui vous croyez que nous puissions envoyer un bulletin d'adhésion.

"Le Congrès aura les mêmes buts qui ont été fixés pour le Ier Congrès international de Paris, le règlement, qui va être imprimé et qui vous sera tout prochainement adressé, suivra à peu près les lignes tracées par le règlement du Ier Congrès.

"Nous vous adressons dès maintenant une ébauche du programme, où sont indiquées les principales questions qui pourront être objet de rapports et de communications.

"Tout en vous priant de nous indiquer si quelques savants de vos compatriotes veulent bien se charger de rédiger des rapports sur les questions qui sont dans le programme, nous vous serions obligés si vous vouliez bien nous proposer d'autres thèmes d'intérêt général, ainsi que les noms des relateurs.

"Lorsque vous aurez l'obligeance de nous faire part de la constitution de votre Comité National, veuillez aussi nous faire connaître s'il est préférable que toute communication soit adressée personnellement aux différents membres du Comité, ou bien toujours par la voie de la Présidence ou du Secrétariat.

"Nous nous réservons de vous communiquer prochainement, avec le règlement, la date précise du Congrès, les réductions qui pourront être accordées par les chemins de fer et par les compagnies de navigation, etc.; mais dès maintenant nous vous prévenons qu'il sera nécessaire que les titres des différents rapports et des communications (sur les thèmes des rapports, ou sur d'autres sujets se rattachant à la pathologie comparée) ainsi qu'un abrégé (25 lignes de 46-54 lettres chacune) puissent parvenir au Secrétariat Général pas plus tard que le 15 décembre 1920; âfin que l'on aie le temps de rédiger et d'imprimer le programme définitif, qui sera envoyé à tous les Congressistes.

"Le droit d'admission a été fixé à 40 lires.

"Toute correspondance relative au Congrès doit être adressé à M. le Prof. Mario Levi Della Vida, Secrétaire Général du Comité d'Organisation, 58 Via Palermo, Rome.

"Nous vous remercions d'avance, Monsieur et très honoré Confrère, de la peine que vous voudrez bien prendre âfin de contribuer à la bonne réussite du IIème Congrès International de Pathologie Comparée; et nous vous prions d'agréer l'assurance de notre parfaite considération.

"*Le Secrétaire Général*, "*Le Président*,
"MARIO LEVI DELLA VIDA." "E. PERRONCITO."

(PROVISIONAL PROGRAMME, JUNE, 1920.)

(*a*) Influenza de l'homme et des animaux—(*b*) Fièvre aphteuse; nouvelles recherches—(*c*) Cancer et sarcome. Les données actuelles sur la question du cancer—(*d*) Rage et vaccination Pasteurienne; résultats—(*e*) Peste bovine ou des ruminants; nouvelles recherches—(*f*) Peste des poules et les dernières recherches sur les maladies des poules—(*g*) Peste des abeilles (*h*) Cycle évolutif du *Dibothriocephalus latus* de l'homme et des animaux—(*i*) Flasserie des vers-à-soie—(*j*) Cycle évolutif des ascarides—(*k*) Cycle évolutif des ankylostomes—(*l*) Les piroplasmoses—(*m*) Questions relatives aux acares, et la gale de l'homme et des animaux—(*n*) La régénération des nerfs dans la pathologie expérimentale, dans les maladies nerveuses et dans les lésions de guerre—(*o*) Symbiose et parasitisme chez les végétaux—(*p*) Ténacité de vie des parasites animaux et végétaux—(*q*) *Diaspis pentagona* et *Prospartella Berlesei*, et insecticides—(*r*) Questions relatives au *Phylloxera*.

In a further letter from the Secretary General, dated June 30, 1920, I am requested to send him the names of those persons throughout the British Empire who may desire to aid in the work of the Congress. Therefore, pending the formation of our Committee, communications may be addressed to me by those who are interested.

The Secretary General is prepared to receive titles and abstracts of papers dealing with Comparative Pathology of Man, Animals and Plants, provided that the communications do not reach him later than December 15, 1920.

Those desiring to attend the Congress are requested to communicate either with the Secretary General or with me.

GEO. H. F. NUTTALL.

Address:—
Prof. GEORGE H. F. NUTTALL, Sc.D., F.R.S.,
Longfield, Madingley Road,
Cambridge, England.

ROYAL ARMY MEDICAL COLLEGE.

THE books in the following list, being surplus to the requirements of the library, are available for distribution among the libraries of military hospitals. Applications for any of these books should be made to the Commandant, Royal Army Medical College. Applications from individual Royal Army Medical Corps officers will also be entertained for any books not required by military hospitals. Officers obtaining books in this way will have to pay for the carriage. Any books not applied for within six months will be sold.

Author	Title of work	Edition	Date	Number of vols.
Abel	Laboratory Handbook of Bacteriology		1907	1
Crookshank	Manual of Bacteriology	2nd	1887	1
Emery	Clinical Bacteriology and Hæmatology	4th	1912	1
Eyre	Bacteriological Technique		1903	1
Kolle and Wassermann	Handbuch der Pathogenic Mikro-organismen		1902-03	3
Muir and Ritchie	Manual of Bacteriology	4th	1907	1
Muter	A Short Manual of Analytical Chemistry	9th	1903	1
Cole	Practical Physiological Chemistry	3rd	1913	1
Halliburton	A Text-book of Chemical Physiology and Pathology		1891	1
Bergey	The Principles of Hygiene	2nd	1904	1
Goodrich	Disposal of Town's Refuse		1901	1
Pakes	The Science of Hygiene		1900	1
Reid	Practical Sanitation		1892	1
Wanhill and Beveridge	Practical Hygiene		1909	1
Prout	Lessons on Elementary Hygiene and Sanitation	2nd	1908	1
Hart	How to Cut the Drug Bill	2nd	1910	1
Thompson	Compendium of Medicine and Pharmacy	3rd	1910	1
Basu	The Dietetic Treatment of Diabetes		1909	1
Cooper	The Sexual Disabilities of Man		1908	1
Diculapoy	A Text-book of Medicine		1910	2
Gee	Auscultation and Percussion		1870	1
,,	Medical Lectures and Clinical Aphorisms	2nd	1907	1
MacKenzie	Exercise in Education and Medicine	2nd	1915	1
Wheeler and Jack	Handbook of Medicine	3rd	1908	1
Castellani and Chalmers	Tropical Medicine		1910	1
,,	Tropical Medicine	2nd	1913	1
Daniels	Tropical Medicine and Hygiene		1909-12	3
Deadrick	A Practical Study of Malaria		1909	1
Rogers	Fevers in the Tropics	2nd	1910	1
Daniels and Stanton	Laboratory Studies in Tropical Medicine		1907	1
West	Diseases of Women	2nd	1858	1
Cooper, S.	The First Lines of the Practice of Surgery		1836	1
Cunning	Aids to Surgery	2nd	1908	1
,,	,, ,,	3rd	1913	1
Stewart and Evans	Nerve Injuries and their Treatment		1916	1
Hull	Surgery in War		1916	1
Jacobson	The Operations of Surgery	3rd	1897	1
Wheeler	Student's Handbook of Operative Surgery	2nd	1910	1
MacEwan	Surgical Anatomy		1910	1
Elliot	Operative Treatment of Glaucoma		1913	1
Harman	Aids to Ophthalmology	4th	1908	1
Pye	Surgical Handicraft		1909	1
Morton	A Text-book of Radiology		1915	1
Harris	Electrical Treatment	2nd	1910	1
Holt	Diseases of Infancy and Childhood		1903	1
Howell	Handbook of Physiology		1901	1
Campbell	Aids to Pathology		1908	1
Gibbes	Practical Histology and Pathology	3rd	1885	1
Rendle Short	The New Physiology in Surgical and Medical Practice		1911	1
Stewart	A Manual of Physiology	6th	1910	1
Prescott and Winslow	Elements of Water Bacteriology		1904	1

Author	Title of work	Edition	Date	Number of vols.
Thresh	Examination of Water and Water Supplies	..	1904 ..	1
Savage	Insanity and Allied Neuroses	..	1908 ..	1
Sawyer	Maladies of the Heart	..	1908 ..	1
French	Differential Diagnosis	..	1912 ..	1
Mansell Moullin	The Biology of Tumours..	..	1913 ..	1
	Trench Fever; Report of Commission of American Red Cross Research Committee.	..	1918 ..	1
	The Medical and Surgical History of the War of the Rebellion—			
	Medical Volumes. Part 1, 2 and 3 .. .. (Two copies of Parts 2 and 3)	..	1870-88 ..	5
	Surgical Volumes. Parts 2 and 3 .. .. (Two copies of Part 3)	..	1876-83 ..	4
	Index Catalogue of the Library of the Surgeon-General's Office, United States Army. Second Series—			
	Vols. 1 to 9	..	1896-04 ..	9
	Vol. 16	..	1911 ..	1
	Vol. 21	..	1916 ..	1
	New Sydenham Society Publications—			
	A Collection of the published writings of the late Thomas Addison, D.D. Edited by Dr. Wilks and Dr. Daldy	..	1868 ..	1
Benatz and Goupil	Clinical Memoirs of the Diseases of Women. Translated and Edited by Alfred Meadows, M.D.	..	1866 ..	2
	Memoirs on Diphtheria from the Writings of Bretonneau and others. Translated by R. H. Semple, M.D.	..	1859 ..	1
Bright, Dr. ..	Clinical Memoirs on Abdominal Tumours. Edited by G. H. Barlow, M.D.	..	1861 ..	1
Caspar, J. L. ..	A Handbook of the Practice of Forensic Medicine. Translated by G. W. Balfour, M.D.	..	1861-65 ..	4
	Selected Monographs. By Czermak, Dusch, Van der Kolk, Radicke and Esmarch	..	1861 ..	1
Diday, P. ..	A Treatise on Syphilis in New-Born Children and Infants at the Breast. Translated by G. Whitley, M.D.	..	1859 ..	1
Donders, F. C.	Accommodation and Refraction of the Eye. Translated by W. D. Moon, M.D.	..	1864 ..	1
Frerichs, F. T.	A Clinical Treatise on Diseases of the Liver. Translated by C. Murchison, M.D.	..	1860-61 ..	2
Gooch	On some of the most Important Diseases Peculiar to Women	..	1859 ..	1
Griesinger, W.	Mental Pathology and Therapeutics. Translated by C. L. Robertson, M.D., and J. Rutherford, M.D.	..	1867 ..	1
Hebea, F. ..	Diseases of the Skin. Vols. 1 and 2. Translated by C. H. Fagge	..	1866-68 ..	2
Kramer, W. ..	The Aural Surgery of the Present Day. Translated by H. Power	..	1863 ..	1
	Selected Monographs. By Kussmaul, Tenner, Wagner and Graefe	..	1859 ..	1
Lancereaux, E.	A Treatise on Syphilis. Translated by G. Whitley, M.D.	..	1868 69 ..	2
Neubauer and Vogel	A Guide to the Qualitative and Quantitative Analysis of the Urine. Translated by W. O. Markham ..	..	1863 ..	1
Niemeyer, F. von	Clinical Lectures on Pulmonary Consumption. Translated by C. Baeumler, M.D.	..	1870 ..	1
Stricker, S. ..	Manual of Human and Comparative Histology. Translated by H. Power. Vol. 1	..	1870 ..	1
Trousseau, A...	Lectures on Clinical Medicine. Translated by P. V. Brazier, M.D.	..	1868 70 ..	3
Van der Kolk, S.	On the Spinal Cord and Medulla Oblongata and on Epilepsy. Translated by W. D. Moore	..	1859 ..	1
Wunderlich, C. A.	On the Temperature in Diseases: a Manual of Medical Thermometry. Translated by W. B. Woodman	..	1871 ..	1

Total number of volumes .. 112

MILITARY WIDOWS' FUND, BRITISH SERVICE.

The Military Widows' Fund, British Service, was established in India in 1820 to alleviate the distress of families of officers of the British Service, *serving in India*, and to enable them to return to England without unnecessary delay. Whenever an officer of the British Service, who is a subscriber to the Fund, dies, his family receives at once the following assistance, namely, six months' maintenance allowance ranging from Rs. 2,400 to Rs. 3,600 according to the rate subscribed, plus Rs. 1,500 as a donation for the widow, plus Rs. 500 or Rs. 300 as a donation for each child according to whether the child is over 12 and under 21 years of age or under 12 years of age. These benefits are secured by a small subscription of Rs. 4, 3 or 2 per mensem, which is regulated by the amount of pay an officer draws. An officer, on becoming a subscriber, secures for his wife and children quite irrespective of his length of service in India, the full benefits of the Fund in case of his death after having subscribed for fully three months. In the event of an officer dying within that period, his case is specially considered by the Committee of General Management.

Copies of the regulations of the Fund and other particulars relating thereto can be obtained from the Secretary at Simla.

OBITUARY NOTICE.

MAJOR AND QUARTERMASTER HENRY WILLIAM GLOVER.

Royal Army Medical Corps.

Major and Qmr. H. W. Glover, Royal Army Medical Corps, died in Queen Alexandra's Military Hospital, Millbank, on June 3.

He enlisted in the Royal Field Artillery at Athlone on May 10, 1878, and transferred to the Army Hospital Corps on August 1, 1883. He served twenty-two years in the various ranks before promotion to Lieutenant and Quartermaster on March 17, 1900. During this period he saw active service in the Egyptian Campaign, 1885.

He subsequently became Serjeant-Major at the Depot at Aldershot (1898 to 1900), and was for ten years after that Quartermaster at the Cambridge Hospital and the Connaught Hospital at Aldershot.

He was on active service again in the South African War with the 21st Field Ambulance, and subsequently with the hospital ship *Nubia*, obtaining the Queen's Medal with three clasps.

He was promoted Captain on March 17, 1910. He was on active service in the Great War, mobilizing with No. 3 General Hospital and leaving for France on August 15, 1914. He served in France until February, 1917, when he was invalided home, having been promoted to Major on March 17, 1915. He then served with the Chester War Hospital until its closing recently.

He held the following medals and decorations: Egyptian Sudan—1885, with clasp, Suakin. South Africa—Queen's Medal with clasps; South Africa, 1901—Wittebergen and Cape Colony. Great War—1914 Star. Great War—General Service and Victory Medals. Long Service and Good Conduct Medals. Coronation Medal of King George V. Khedive's Star, 1885.

He will be much missed in Chester, where he had a host of friends. He was an enthusiastic Freemason and an active member of the Army Temperance Association, being a life-long teetotaller.

He brought to his work much honesty of purpose, thoroughness in detail, zeal and reliability in execution; these, combined with his long experience and thorough knowledge, made him a most competent and excellent officer. By his death the Royal Army Medical Corps has sustained a great loss.

He was buried with full military honours in the Chester Cemetery on June 8, the first part of the service being conducted at All Saints' Church at Hoole, of which he was a sidesman. The Depot of the Cheshire Regiment sent their band and a firing party, and there was a large attendance of officers, warrant officers, non-commissioned officers and men of the Corps and of the Headquarters Western Command.

He would have retired on pension on June 9, after forty-two years service. He is survived by his widow and three children.

BIRTHS.

GRAY.—On August 29, at Woodmancote, St. Leonards-on-Sea, the wife of Major (Temp. Lieut.-Col.) A. C. H. Gray, O.B.E., R.A.M.C., of a son.

McCREERY.—On September 2, 1920, at Huntly, Parkstone, Dorset, the wife of Major A. T. J. McCreery, M.C., M.B., Royal Army Medical Corps, of a daughter.

O'BRIEN.—On August 23, at Sutton, Surrey, to Dorothy, wife of Major C. W. O'Brien, a son.

NICKERSON.—On August 22, at Salisbury, the wife of Colonel Nickerson, of a daughter.

HART.—On September 9, at Fir Bank, Shanklin, Isle of Wight, the wife of Major H. P. Hart, M.C., Royal Army Medical Corps, of a son.

EXCHANGES, &c.

The charge for inserting Notices respecting Exchanges in the Royal Army Medical Corps is 5/- for not more than five lines, which should be forwarded by Cheque or P.O.O., with the notice, to Messrs. G. STREET and CO., Ltd., 8, *Serle Street, London, W.C., not later than the* 22*nd of the month.*

Lt.-Colonel, R.A.M.C., with 2½ years (*i.e.*, half) Indian Tour to complete, wishes to exchange with an officer of similar rank at home. Exchange must insure at least 3 to 4 years in England. Apply A.W., c/o Messrs. Holt & Co., 3, Whitehall Place, S.W. 1.

Major, due abroad this Trooping Season, wishes exchange home roster; good terms. Apply "C.B.," c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C. 2.

Lt.-Colonel, recently invalided from India, with four and a-half years' unexpired service in India, wishes to communicate with an officer of field rank serving in England with from one to two years to run and who is desirous of proceeding to India. Apply P., c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C.2.

Major arrived home beginning 1920 after ten years' tour foreign service, is willing to exchange for a tour of service abroad. Colonies only. Apply J., c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C.2.

Major due for abroad trooping season, 1921-22, is willing to exchange to go present trooping season. Reply, stating terms to K.A.C.D., c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C.2.

Very Senior Captain, low down on roster, is willing to exchange to go to India this trooping season. Replies, stating terms offered, should be sent to R.P., c/o "Journal of the R.A.M.C.," 8, Serle Street, London, W.C.2.

Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

Matter intended for the Corps News should reach the Editor not later than the 15th of each month for the following month's issue. Notices of Births, Marriages, and Deaths are inserted free of charge to subscribers and members of the Corps. All these communications should be written upon one side of the paper only; they should by preference be type-written; but, if not, all proper names should be written in capital letters (or printed) to avoid mistakes, and be addressed: The Editor, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," 56, Cornwall House, Stamford Street, S.E. 1.

MANAGER'S NOTICES.

The JOURNAL OF THE ROYAL ARMY MEDICAL CORPS is published monthly, a volume commencing on 1st July and 1st January of each year.

The Annual Subscription is £1 (which includes postage), and should commence either on 1st July or 1st January; but if a subscriber wishes to commence at any other month he may do so by paying for the odd months between 1st July and 1st January at the rate of 1s. 8d. (one shilling and eightpence) per copy. (All subscriptions are payable in advance.)

Single copies can be obtained at the rate of 2s. per copy.

The Corps News is also issued separately from the Journal, and can be subscribed for at the rate of 2s. (two shillings) per annum, including postage. (All subscriptions are payable in advance.)

Cheques or Postal Orders for Subscriptions, etc., should be made payable to the "Hon. Manager, Journal R.A.M.C.," and crossed "Holt & Co."

All communications regarding subscriptions, etc., should be addressed to THE HON. MANAGER, "JOURNAL OF THE ROYAL ARMY MEDICAL CORPS," WAR OFFICE, WHITEHALL, S.W. 1.

A free issue of twenty-five reprints will be made to contributors of Original Communications, and of twenty-five excerpts of Lectures, Travels and Proceedings of the United Services Medical Society.

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JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

NOVEMBER, 1920.

EXTRACTS FROM THE "LONDON GAZETTE."

War Office,
August 18, 1920.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS CONFERRED BY THE PRESIDENT OF THE UNITED STATES OF AMERICA.

Distinguished Service Medal.

Major-Gen. Sir William Boog Leishman, K.C.M.G., C.B., F.R.S., M.B., F.R.C.P., F.R.F.P.S., K.H.P.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE BELGIANS.

Croix Civique.

1st Class.—Lieut.-Col. Standish de Courcy O'Grady, C.M.G., D.S.O., M.B., Royal Army Medical Corps.

Médaille Civique.

1st Class.—1157 Pte. (Temp. Corpl.) Albert Edward Gray, Royal Army Medical Corp (Rotherhithe, S.E.).

DECORATIONS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Légion d'Honneur.

Chevalier.—Temp. Capt. (Temp. Major) Reginald Laidlaw Davies, O.B.E., M.B., F.R.C.S., Royal Army Medical Corps

Médaille des Epidémies, en Argent.

Major William Atkin Thompson, Royal Army Medical Corps (Territorial Force).

Médaille de l'Assistance Publique, en Argent.

Temp. Capt. Harold Oscar Gough, Royal Army Medical Corps.
Lieut.-Col. Henry MacCormac, C.B.E., M.D., F.R.C.P., late Royal Army Medical Corps.

Médaille de l'Assistance Publique, en Bronze.

Temp. Capt. Henry Murray Agnew, Royal Army Medical Corps.
Temp. Capt. Mervyn Eager, Royal Army Medical Corps.
Temp. Major Thomas Norton Frood, Royal Army Medical Corps.
Temp. Capt. Frederick Alexander Ross, M.B., Royal Army Medical Corps.
135043 Pte. Michael O'Toole, Royal Army Medical Corps (West Melton, Yorks.).
71723 Pte. Robert Poots, Royal Army Medical Corps (Belfast).

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF ROUMANIA.

Order of the Crown of Roumania.

Chevalier: Temp. Capt. Mervyn Eager, Royal Army Medical Corps.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF SERBIA.

Samaritan Cross.

5250 Serjt. Herbert Thomas King, Royal Army Medical Corps (Harpenden, Herts).

4854 Pte. (Acting Serjt.) John Joseph O'Donnell, Royal Army Medical Corps (Newcastle-on-Tyne).

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE HEDJAZ.

Order of El Nahda.

4th Class.—Capt. Frederick McKibbin, M.B., Royal Army Medical Corps (Special Reserve).

CORRECTIONS.

London Gazette, 31890, dated May 7th, 1920, page 5230, Serbian Order of St. Sava, 5th Class. Capt (Acting Major) Richard Patrick Starkie, Royal Army Medical Corps (Special Reserve), is now correctly described.

London Gazette, No. 31923, dated June 1, 1920, page 6034: French Médaille d'Honneur avec Glaives, en Bronze—For 316105 Serjt. John Dewar, 1/2nd (Lowland) Field Ambulance. Royal Army Medical Corps (Territorial Force) ("E" Glasgow), substitute 318016 Serjt. James Scott Dewar, 1/2nd (Lowland) Field Ambulance, Royal Army Medical Corps (Territorial Force) (Glasgow).

War Office,
September 3, 1920.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the undermentioned Non-commissioned Officers in recognition of valuable services rendered in India in connexion with the War. Dated June 3, 1919:—

ROYAL ARMY MEDICAL CORPS.

37070 Staff-Serjt. (Acting Qmr.-Serjt.) F. W. Shaw (Tipton).

36457 Serjt. W. Hall (Birmingham).

18301 Serjt. (Acting Staff-Serjt.) C. J. Molden (Miles Platting).

ROYAL ARMY MEDICAL SERVICE.

Col. Frederick Kiddle, C.M.G., M.B., is placed on half pay, dated August 23, 1920.

ROYAL ARMY MEDICAL CORPS.

Lieut.-Col. Robert J. W. Mawhinny, C.B., relinquishes the temporary rank of Colonel, dated July 11, 1916.

Lieut.-Col. Ernest S. Clark, M.B., is placed on retired pay, dated September 24, 1920.

Lieut.-Col. Robert A. Cunningham, M.B., retires on retired pay, dated October 1, 1920.

Lieut. (Hon. Capt.) Frederick Dudley Ross-Keyt, M.B., from Territorial Force Reserves (Artillery), to be Lieutenant, dated August 16, 1920, with precedence next below A. M. Simson.

Temp. Lieut. William E. Shipsey relinquishes his commission, dated September 12, 1920, and retains the rank of Lieutenant.

Lieut.-Col. Horace S. Roch, C.M.G., D.S.O., relinquishes the acting rank of Colonel, dated June 29, 1920.

Temp. Lieut.-Col. William Murray, T.D., M.D. (Lieut.-Col., R.F.A., T.F.), relinquishes his temporary commission, dated January 7, 1919.

Temp. Lieut.-Col. Thomas Saxty Good, O.B.E., relinquishes his commission on ceasing to be employed at the Ashurst War Hospital, dated August 1, 1920, and retains the rank of Lieutenant-Colonel.

Major William Bruce, O.B.E., M.B., from New Zealand Medical Corps, to be Captain, dated November 18, 1918, but not to reckon for pay for allowances prior to August 19, 1920, with precedence next below D. McVicker.

Temp. Major Arthur L. B. Green, D.S.O. (Major, 1st Hereford Reserves, Territorial Force), relinquishes his temporary commission, dated March 20, 1919. (Substituted for the notification in the *Gazette* of July 26, 1920.)

Temp. Major Graham S. Simpson, F.R.C.S. (Captain, Royal Army Medical Corps, Territorial Reserves), relinquishes his temporary commission on reposting. Dated August 1, 1920.

Capt. Frank Holmes, M.B., from Special Reserves, to be Lieutenant, and to be temporary Captain, dated October 10, 1918, but not to reckon for pay or allowances prior to August 1, 1920, with precedence next below J. E. Rea.

Capt. John Campbell Preston, M.B., from Special Reserves, to be Captain, dated February 15, 1920, but not to reckon for pay or allowances prior to August 1, 1920, with precedence next below R. H. C. Pryn.

Capt. Harold J. Bensted, M.C., to be temporary Major whilst specially employed, dated July 5, 1920.

Capt. Neil Cantlie, M.C., M.B., is seconded for service with the Egyptian Army, dated July 30, 1920.

Capt. John McP. MacKinnon, M.B., is seconded for service with the Egyptian Army, dated August 5, 1920.

Capt. Hubert L. C. Noel resigns his commission, dated September 10, 1929.

Capt. Robert C. Matson is placed on the half pay list on account of ill-health contracted on active service, dated September 18, 1920.

Capt. Kenneth P. MacKenzie, M.B., is restored to the establishment, dated September 22, 1920.

Capt. William Tyrrell, D.S.O., M.C., M.B., resigns his commission on appointment to the R.A.F., dated October 1, 1920.

Capt. Ian D. Dickson, M.C., M.D., resigns his commission, dated October 5, 1920, and retains the rank of Captain.

The notification in the *Gazette* of February 12, 1920, regarding Capt. Walter E. Adam, M.C., M.D., is cancelled.

Temp. Capt. John McPhail MacKinnon, M.B., to be Captain, dated April 3rd, 1918, but not to reckon for pay or allowances prior to July 1, 1919, with precedence next below J. McFadden. (Substituted for the notifications in the *Gazettes* of August 9 and September 3, 1919.)

Temp. Capt. Reginald Johnson, M.B.E., M.B., to be Captain, dated July 10, 1919, but not to reckon for pay or allowances prior to September 1, 1920, with precedence next below W. Millerick.

Temp. Capt. John Eric Measham, M.B., to be Lieutenant, and to be Temporary Captain, dated August 1, 1917, but not to reckon for pay or allowances prior to September 1, 1920, with precedence next below G. W. B. Shaw.

Roy Bertram Jenkins, M.C., late Captain, Canadian Army Medical Corps, to be Temporary Captain, dated August 4, 1920.

James Gordon Freeman Heal, M.D., late Temporary Captain, to be Temporary Captain, dated September 1, 1920, with seniority from August 13, 1917.

Temp. Captain Robert L. Brown relinquishes his commission on account of ill-health contracted on active, dated September 10, 1920, and retains the rank of Captain.

Temp. Capt. Arthur R. Rendle, M.D., relinquishes his commission, dated September 13, 1920, and retains the rank of Captain.

The undermentioned Lieutenants (Temporary Captains) to be Captains:—

Dated August 1, 1920.—George E. L. Simons.

Dated August 5, 1920.—Edward Parker, M.B.; Leslie G. Blackmore.

Dated August 10, 1920.—Victor J. Bonavia, M.D.

Dated August 16, 1920.—Douglas J. Batterham.

The undermentioned to be Acting Lieutenant-Colonels:—

Dated April 22 to May 6, 1920.—Temp. Major James Turton, V.D., F.R.C.S. (Colonel, Territorial Force Reserve, Army Medical Service).

Dated June 12 to September 17, 1920.—Capt. Walter E. Adam, M.C., M.D.

Dated July 13, 1920.—Capt. and Brevet Major Maurice J. Williamson, M.C., M.B.

Dated July 27, 1920.—Major Charles R. M. Morris, D.S.O., M.B.

The undermentioned Temporary Lieutenants relinquish their commissions and retain the rank of Lieutenant:—

Dated August 11, 1920.—Temp. Lieut. Felix Formosa, M.D.

Dated August 12, 1920.—Frederick T. Allen.

The undermentioned relinquish the acting rank of Lieutenant-Colonel:—

Dated October 17, 1919,—Major William Davis.

Dated February 20 1920.—Major Alexander J. Williamson, M.B.

Dated March 30, 1920.—Major Edmund T. Potts, C.M.G., D.S.O., M.D.

Dated April 10, 1920.—Temp. Major Nelson G. Cooper, M.D.

Dated May 1, 1920.—Major Leopold A. A. Andrews.

Dated May 12, 1920.—Major Ernest B. Lathbury, O.B.E.

Dated May 15, 1920.—Major Edward E. Parkes, M.B.

Dated May 31, 1920.—Major Thomas J. Wright, D.S.O.

Dated June 22, 1920.—Major Thomas T. H Robinson, D.S.O., M.B.

Dated July 7, 1920.—Capt. and Brevet Major Maurice J. Williamson, M.C., M.B.

Dated August 22, 1920.—Capt. and Brevet Major Maurice J. Williamson, M.C., M.B.

The undermentioned to be Acting Majors:—

Dated January 4, 1918.—Capt. Brevet Major Alexander G. J. MacIlwaine, C.I.E.

From January 4 to August 13, 1918, inclusive.—Temp. Capt. Henry Cordner. M.B.

From January 4 to August 13 inclusive.—Temp. Capt. Andrew Topping, M.B.

From September 1, 1918, to June 30, 1920, inclusive.—Capt. William L. E. Fretz, M.B.

Dated October 2, 1919.—Capt. Henry R L'Estrange, O.B.E.

Dated December 15, 1919.—Capt. John M. Macfie, M.C., M.B.

The undermentioned Temporary Captains relinquish the acting rank of Major :—
Dated December 12, 1918.—Henry L. Tidy, M.D.
Dated February 10, 1919.—John H. Thornley, M.C., M.B.
Dated March 8, 1919.—Ernest Scott, D.S.O., M.B.
Dated April 7, 1919.—Philip N. Vellacott, M.B.
Dated April 8, 1919.—Frederick B. Winfield.
Dated April 14, 1919.—James L. Wilson, M.B.
Dated April 19, 1919.—Dennis C. McCabe-Dallas.
Dated July 1, 1919.—Claude B. Tudehope, M.B.
Dated September 20, 1919.—George W. B. Waters.
Dated October 10, 1919.—Ewen G. M. Gilchrist, M.B.
Dated January 8, 1920.—Duncan Miller, M.B.
Dated March 1, 1920.—Horace B. Wilson, O.B.E.
Dated May 15, 1920.—Victor Vesselovsky.
Dated May 31, 1920.—George Marshall, M.B.
Dated June 22, 1920.—William B. Swete-Evans, M.D.
Dated December 31, 1920.—George Marshall, M.B.

The undermentioned relinquish the acting rank of Major :—
Dated February 15, 1919.—Capt. William Foot, M.C., M.B.
Dated February 16, 1919.—Temp. Capt. Francis P. Young, M.D.
Dated August 3, 1919.—Capt. and Brevet Major Samuel W. Kyle, M.B. (Substituted for the notification in the *Gazette* of December 4, 1919.)
Dated June 29, 1920.—Capt. Francis C. Tibbs.
Dated July 22, 1920.—Capt. Arthur W. Dennis, M.B.
Dated February 15, 1920.—Capt. and Brevet Major William L. Webster, M.B.

The undermentioned Captains are restored to the establishment :—
Dated April 11, 1920.—William C. Hartgill, M.C.
Dated April 20, 1920.—Charles D. M. Buckley, M.C., M.B.; Thomas J. L. Thompson, M.C., M.B.

The undermentioned Captains, late Royal Army Medical Corps, Special Reserves, to be Lieutenants, and to be Temporary Captains, but not to reckon for pay or allowances prior to August 31, 1920 :—
Dated May 28, 1917.—James Sutherland Balkwill Forbes, M.B., with precedence next below J. M. Morrison.
Dated July 26, 1917.—William Calthorpe MacKinnon, M.B., with precedence next below G. W. B. Shaw.

The undermentioned to be Temporary Captains :
Dated June 3, 1920.—Douglas Ethelbert Hearn, late Captain Royal Army Medical Corps, Special Reserves, with seniority from November 9, 1918. (Substituted for the notification in the *Gazette* of August 13, 1920.)
Dated August 9, 1920.—James Douglas Judson, M.B., late Temporary Captain, with seniority from June 2, 1917.
Dated August 13, 1920.—Hugh Harper McClelland, M.B., late Temporary Captain, with seniority from January 30, 1919.
Dated September 10, 1920.—Henry Halkett Crickitt, late Temporary Captain, with seniority from June 22, 1916.
Dated September 11, 1920.—Hubert Lewis Clifford Noel, late Captain, with seniority from March 9, 1916.
Dated September 13, 1920.—Ronald Hodson, M.C., M.B., late Temporary Captain, with seniority from February 3, 1915; Maurice Shipsey.

The undermentioned Temporary Captains relinquish their commissions, and are granted the rank of Lieutenant-Colonel :—
Dated October 9, 1919.—(Acting Major) Charles J. West, O.B.E., M.D. (Substituted for the notification in the *Gazette* of November 8, 1919).
Dated March 13, 1920.—Robert Svensson, D.S.O., M.C., M.B. (Substituted for the notification in the *Gazette* of April 12, 1920.)

The undermentioned relinquish their commissions :—
Dated April 7, 1919.—Temp. Capt. Robert M. Clarke, M.B.
Dated August 4, 1920.—Temp. Capt. Francis Hannigan.
Dated August 21, 1920.—Temp. Capt. Frederick R. Kirkham, M.B., and is granted the rank of Major.
Dated September 2, 1920.—Temp. Major Robert H. Nicholson, and retains the rank of Major; Temp. Capt. Thomas Heywood, M.D., and retains the rank of Captain.
Dated September 4, 1920.—Temp. Capt. Cecil W. Joynt.
Dated September 13, 1920.—Temp. Major Nelson G. Cooper, M.D., and retains the rank of Major.

The undermentioned relinquish their commissions, and retain the rank of Lieutenant-Colonel:—

Dated August 3, 1920.—Temp. Lieut.-Col. Edwin Goodall, C.B.E., M.D., F.R.C.P., on ceasing to be employed at the Welsh Metropolitan Hospital.

Dated August 24, 1920.—Temp. Lieut.-Col. John B. Byles, M.B., F.R.C.S., on ceasing to be employed at the Brook War Hospital.

The undermentioned Temporary Captains relinquish their commissions, and are granted the rank of Major:—

Dated August 12, 1920.—William E. Graves.

Dated September 9, 1920.—Herbert M. Vickers, M.B.

The undermentioned Temporary Captains relinquish their commissions and retain the rank of Captain:—

Dated February 6, 1920.—John C. Robertson, M.B.

Dated March 16, 1920.—Archibald S. Cook, M.B.

Dated April 10, 1920.—Ernest C. Arnold, M.B., F.R.C.S.

Dated April 30, 1920.—William E. Fraser, M.D.

Dated May 29, 1920.—Wilfrid Garton.

Dated July 26, 1920.—Hugh H. Perry, M D.

Dated July 28, 1920.—Harold C. Sutton, M.B.

Dated August 1, 1920.—William L. G. Anderson, M.B.; Philip Johnson; John M. MacPhail, M.D.

Dated August 9, 1920.—Willoughby H. Harvey, M.D.

Dated August 11, 1920.—James M. Wallace.

Dated August 12, 1920.—Thomas N. M. Horsfall, M.B.; Albert W. G. Magee, M.B.; Francis C. Plummer, M.B.

Dated August 13, 1920.—Harold Harrison, M.B.

Dated August 15, 1920.—Robert Hamilton, M.D.

Dated August 17, 1920.—Arthur E. Wood, M.D.

Dated August 18, 1920.—David Manson, M.B.

Dated August 20, 1920.—Alexander R. Berrie, M.B.; William M. Howells, M.B.

Dated August 24, 1920.—John N. M. Sutherland, M.B.

Dated August 27, 1920.—Charles G. Buron, on account of ill-health contracted on active service; John L. Rubidge, M.B.

Dated August 28, 1920.—Thomas A. O'Brien, M.B.

Dated August 29, 1920.—Clement I. Stockley, M.B.

Dated September 7, 1920.—John A. C. Smith, M.B.

Dated September 9, 1920.—Joseph H. Fenn.

Dated September 11, 1920.—John W. Harvey.

Dated September 12, 1920.—Roy D. Nasmyth, M.D.; David P. Thomas; James R. Watson, M.B.; Richard L. Wilcox.

Dated September 16, 1920.—Horace E. Alexander, M.D.; Thomas B. Dakin.

Dated September 19, 1920.—Ernest G. Sworder, M.B.

Dated September 23, 1920.—Albert J. Adkins, M.D.

The notifications in the *Gazette* of August 18, 1920, regarding the undermentioned are cancelled:—

David Bell Robertson, M.B.

Harold Awbery Hill.

William Henry Simmons.

SPECIAL RESERVE OF OFFICERS.

Royal Army Medical Corps.

The undermentioned Captains relinquish their commissions and retain the rank of Captain:—

Dated April 1, 1920.—Mervyn C. Cooper; Trefor H. Rhys; Walter V. Tothill.

Dated May 19, 1920.—Thomas O'Mahoney, M.B.

Dated June 1, 1920.—Harold J. Blampied.

Dated June 6, 1920.—Stephen H. de G. Pritchard.

Dated June 23, 1920.—Charles A. W. Ramsay, M.B.; Charles Tighe, M.B.

Dated June 24, 1920.—George F. Hurst, M.B.

Dated June 30, 1920.—John A. Panton, M.B.

Dated July 9, 1920.—John W. W. Baillie, M.B.; Maurice O. Simpson.

Dated July 10, 1920.—Rupert S. Corbett.

Dated July 11, 1920.—Francis J. Charlton, M.B.

Dated July 13, 1920.—Edmund O. Goldsmith; Edgar R. Batho, M.C.; Patrick S. G. Cameron, M.B.

Dated July 14, 1920.—Douglas C. Beaumont.

Dated July 15, 1920.—Harold G. V. Mence.

Dated July 17, 1920.—Dennis V. Murphy, M.B.; James S. B. Forbes, M.B.
Dated July 20, 1920.—James McKay, M.C., M.B.; Robert S. Aspinall; Charles Shearer, M.B.
Dated July 21, 1920.—John S. Craig, M.B.; George M. S. Smith, M.B.; Ralph P. Smith, M.B.
Dated July 23, 1920.—Alfred Piney.
Dated July 24, 1920.—John W. W. Newsome.
Dated July 25, 1920.—Donald J. MacKinnon, M.B.
Dated August 3, 1920.—John C. Pyper, M.B.; Clarence L. Somerville, M.B.; John B. S. Lewis; John McI. H. Smellie, M.B.; John S. Bow, M.B.; John Ashforth, M.B.; Leslie C. Moore; John A. Ross, M.B.; Michael J. Cahalane, M.B.
Dated August 4, 1920.—Charles Wood, M.B.; John J. Conybeare, M.C., M.B.
Dated August 5, 1920.—William L. M. Gabriel, M.B.
Dated August 7, 1920.—William V. Robinson, M.B.
Dated August 11, 1920.—Robert A. Olphert.
Dated August 26, 1920.—Charles A. Bignold, M.B.; George F. Randall.
Dated August 28, 1920.—Griffith I. Evans.
Dated September 14, 1920.—Allan D. Fraser, M.B.

The undermentioned Captains relinquish the acting rank of Major:—
Dated May 14, 1919.—William W. Shorten.
Dated July 3, 1920.—Arthur Bulleid.

The undermentioned Captains relinquish their commissions:—
Dated April 25, 1920.—Kenneth D. Murchison, D.S.O., M.B., and is granted the rank of Lieutenant-Colonel.
Dated August 6, 1920.—Richard E. Grandy, M.B.

The undermentioned Captains relinquish their commisssions on account of ill-health contracted on active service:—
Dated April 8, 1920.—Charles A. McGuire, M.B., and is granted the rank of Major.
Dated January 24, 1920.—George E. Shand, M.D., and retains the rank of Captain.
(Substituted for the notifications regarding these Officers in the *Gazettes* of April 23 and January 23, 1920, respectively.)

The notification in the *Gazette* of May 25, 1920, regarding Trevor A. Butcher, O.B.E., is cancelled.

Capt. (Acting Major) Charles A. McGuire, M.B., relinquishes the pay and allowances of his acting rank, dated September 12, 1918, and relinquishes his acting rank, dated July 11, 1919. (Substituted for the notification in the *Gazette* of June 4, 1920.)

Capt. Robert Taylor, M.C., M.D., relinquishes his commission, dated August 26, 1920, and is granted the rank of Major.

Memoranda.

Temp. Capt. Harold S. Douthwaite relinquishes his commission on ceasing to be employed as a Dental Surgeon, dated August 11, 1920, and retains the rank of Captain.

Temp. Capt. Frank R. Wallis relinquishes his commission on ceasing to be employed as a Dental Surgeon, dated August 24, 1920, and retains the rank of Captain.

South Africa.

South African Medical Corps.

Capt. E. W. Ingle, M.D., to be Major, dated September 9, 1918.

The undermentioned relinquishes his temporary commission on account of ill-health:—
Dated March 14, 1919.—Major E. W. Ingle, M.D., and retains the rank of Major.

The undermentioned Captains relinquish their temporary commissions, and retain the rank of Captain:—
Dated October 11, 1917.—A. A. H. Lawrence.
Dated November 5, 1917.—P. St. J. Wilkinson, F.R.C.S.
Dated January 21, 1918.—A. Jassinowsky, M.B.
Dated February 9, 1919.—E. B. Woolf.
(Substituted for the notifications in the *Gazette* of May 14, 1920.)

The undermentioned relinquishes his temporary commission on ceasing to be employed with the Union Imperial Service Contingents:—
Lieut.-Col. H. A. Moffatt, D.S.O., dated May 6, 1917, and retains the rank of Lieutenant-Colonel.

The undermentioned Captains relinquish their temporary commissions on ceasing to be employed with the Union Imperial Service Contingents:—
Dated September 5, 1917.—(Dental Surgeon) W. Floyd.
Dated October 31, 1918.—R. Stevenson, M.B.
Dated November 1, 1918.—J. Harpur, M.B.
Dated November 16, 1918.—W. H. Hunter, M.B.
Dated December 21, 1918.—D. McCully.

Dated December 23, 1918.—A. J. McClymont.
Dated February 5, 1919.—L. G. Irvine, M.D.
Dated March 5, 1919.—M. Schwartz, M.B.
Dated April 17, 1919.—W. M. Tough, M.B.
(Substituted for the notifications in the *Gazette* of May 25, 1920.)

The name of Qmr. and Capt. G. P. Greensill is as now described, and not as in the *Gazette* of May 14, 1920.

Capt. C. P. Bligh Wall, O.B.E., M.D., to be Acting Lieutenant-Colonel, from August 22, 1918, to March 1, 1919.

Capt. C. P. Bligh Wall, O.B.E., M.D., relinquishes his temporary commission on account of ill-health, dated March 28, 1919, and is granted the rank of Lieutenant-Colonel. (Substituted for the notification in the *Gazette* of May 14, 1920.)

Temp. Capt. G. A. Beyers, M.C., relinquishes his commission on ceasing to be employed with the Union Imperial Service Contingent, dated June 29, 1920, and retains the rank of Captain.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

Sister Miss Elizabeth Ann Rutherford, R.R.C., resigns her appointment, dated August 23, 1920.

No. 7 CO., R.A.M.C., DEVONPORT.—Serjt. Truscott writes:—

In view of the rapid discharge of the one year P.B. Army, it has been somewhat difficult to form a football team this season; however, we manage to collect the remaining men of the R.A.M.C. and fill vacancies with civilian subordinates.

Our first match we lost, although the Corps put up a strenuous fight and had a tower of strength in Serjt.-Major Jepp and Qmr.-Serjt. Rouse, who played with great skill.

Great thanks are especially due to Serjt.-Major Robinson, who with his customary sporting instincts came forward and coaxed the team into a better shape and offered help and advice, which was greatly appreciated.

Qmr.-Serjt. H. Gregory has left the Company for Ireland, whilst Serjt. Davis has been posted to the Depot for service overseas.

Seven men recently joined the Company from the Depot and have the making of good Corps men with sufficient training. Every opportunity of qualifying for advancement to trade rates of pay is offered them, and good results are expected.

Serjt. Butt has also arrived from Ireland for duty.

All candidates who presented themselves for examination in August passed with satisfactory results.

NOTES FROM NETLEY.

Departures.—Serjt. Carter, R.A.M.C., was transferred to the Army Reserve on September 11, 1920. Staff-Serjt. Hine, R.A.M.C., is on furlough pending discharge after twenty-one years, service.

Arrivals.—Staff-Serjt. Loder, R.A.M.C., has joined here from Hong-Kong, China. It may interest many to know that Lieut. George Hinton was admitted here on the 12th inst., ex Panama. "Jerry," as his friends know him, is dangerously ill and had a rough time in Russia. He is keeping bright, however, although suffering from dysentery, malaria and rheumatism.

Cricket.—After an inauspicious opening, the Cricket Team succeeded in winning and losing about an equal number of matches, the most satisfactory point being that the Team did best against the strongest opponents. Five of the eleven had a batting average of over 20, and six bowlers an average of 11 or under. The bowling was the weakest part of the side; everyone could bowl a little, but there was not much variety. Mr. McGibbon, Captain Rowley and Qmr.-Serjt. Sullivan bore the brunt of the season's work, although during the latter half of the summer Captain Keswick and Captain Huntingford did yeoman service, the former topping the batting averages with 30, while the latter secured 26 wickets for 11 runs apiece. McGibbon made the greatest number of runs, and also took the most wickets. Our skipper, Colonel Greenwood, never produced his true form, but played several useful innings nevertheless.

The full score of the Tidworth match is appended. It was unfortunate that neither side was at full strength, and that an unpropitious railway service prevented a definite result.

Hockey looks like being as popular as ever, especially among the Sisters, who promise to have quite a fair side.

The new "Ladders of Fame" for golf and billiards have roused great excitement at the Mess. Major Stephens is at present sitting on the top rung of both, and we look in vain for someone to dislodge him.

Next month we shall have something to say about the foursome competition at Stoneham, and perhaps a preliminary word about beagling.

R.A.M.C., Netley, v. R.A.M.C., Tidworth.

Played at Tidworth on September 1, 1920, resulting in a draw. Scores were as under, viz.:—

Netley.

Capt. Keswick, not out	75
L. E. Bourke, l.b.w. b. MacNaughton ..	2
C. E. McGibbon, b. Cowx	19
Capt. Rowley, run out	37
Capt. Clark, not out	44
Capt. Huntingford, G. Ross, Serjt.-Major Boxshall, Serjt. McIlravey, Serjt. Barber, Serjt. Holloway — did not bat	
Extras	5
Total for 3 wickets	182

Innings declared closed.

Tidworth.

Mr. Jennings, run out	18
Serjt.-Major McGibbon, c. Huntingford, b. Boxshall	11
Qmr.-Serjt. Cowborn, not out	29
Qmr.-Serjt. Corke, b. Boxshall	23
Qmr.-Serjt. Baker, b. McGibbon	1
Lieut. Hardie, b. McIlravey	16
Qmr.-Serjt. Cowx, not out	0
Col. Langford Lloyd, Major MacNaughton, Pte. Broadbent, Cpl. Turner — did not bat	
Extras	5
Total for 5 wickets	103

NOTES FROM THE BERMUDA COMMAND.—Col. Hyde writes:—

August Bank Holiday was the occasion of the Annual Outing of the Royal Army Medical Corps and the men of other units living in the Bungalow. The party, including families, numbered between sixty and seventy, and proceeded in brakes to the South Shore Hotel, a place much frequented by American tourists for the surf bathing, as Elba Beach below the hotel has the finest stretch of white coral sand to be found in Bermuda. The party bathed and had an excellent lunch and tea and spent the evening with music and dancing.

The music was supplied by the Bungalow Band of five performers, ably led by Pte. C. H. Green, Royal Army Medical Corps. Pte. W. Taylor, Royal Army Medical Corps, was the star turn of the evening and sang no less than eight songs. His song on "Prohibition" was particularly pleasing to the American visitors at the hotel, so much so that they specially demanded its repetiton at the close of the evening. Altogether the outing was a great success, and at the close of the day everybody arrived home safe; tired but happy.

The chief event of a sporting nature during August was the final Cricket Match for the Governor's Cup between the Staff and Departments and "D" Company of the 2nd Royal Sussex Regiment.

The game was marked by the extraordinary vicissitudes of fortune which give to cricket so much of its fascination.

The Staff team, going in first, made the substantial score of 221, and then disposed of their opponents for 83, so that on the opening of the second day "D" Company had to follow on. They made 183, which with their previous score gave them a total of 266. The Staff team had accordingly only to make 46 and the cup was theirs. His Excellency, General Sir James Willcocks, was on the ground watching the play and ready to present the cup to the winners.

With apparently so easy a task and perhaps rather naturally confident of the result, the Staff team hastened to bring the match to a conclusion so as to avoid carrying the game to the third day. They went in to bat in a poor light, rendered rapidly increasingly difficult by the nearly horizontal rays of the sun, which was just setting.

Free hitting and rapid making of runs under such circumstances was not easy and the attempt to do so ended in a debâcle, for the time for drawing stumps saw six wickets down for only twenty-six runs. The Royal Sussex, whose position at the end of their second innings seemed well nigh hopeless left the field with high hopes that they might yet snatch a victory, and those of the Staff team who had still to bat with some very natural anxiety.

Very fortunately, however, on the following morning, under the condition of a decent light, the game was pulled out of the fire, and ended in a win for the Staff and Departments by 3 wickets and 1 run.

The Cup was handed to the Captain (Major Beuttlor, Royal Army Service Corps) and medals were distributed to the team by the General the same morning.

The Corps was represented in the match by Major E. A. Sutton, Serjt. A. J. Bew, and Pte. Welch. Major Sutton played a very fine innings of 75 on the first day.

For the August Examination, out of a strength of eighteen other ranks, five presented themselves for examination for promotion and qualifications in special subjects.

Two required examination for promotion to Qmr.-Serjt., one for qualification for dispenser, and two for nursing orderly. This was the first examination held under the new rules and apart

from the efforts of the candidates, was an exacting piece of work for the Local Board, though possibly one not without its elements of usefulness.

Major A. G. Wells, D.S.O., accompanied by his wife and child, arrived by S.S. "Caraquet" on September 19, 1920. He has been posted to Prospect and will take charge of the hospital there.

ROYAL ARMY MEDICAL CORPS FUND.

PROCEEDINGS OF A COMMITTEE MEETING HELD AT THE WAR OFFICE ON OCTOBER 6, 1920.

Present—

Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., Director-General, in the Chair.

Major-Gen. Sir G. B. Stanistreet, K.B.E., C.B., C.M.G., Deputy Director-General.
Major-Gen. Sir W. Donovan, K.C.B.
Col. Sir J. Magill, K.C.B.
Col. O. L. Robinson, G.B., C.M.G., K.H.P.
Col. H. A. Hinge, C.B., C.M.G., D.S.O.
Lieut.Col. A. B. Cottell.
Lieut.-Col. P. S. Lelean, C.B., C.M.G.
Capt. E. B. Allnutt, M.C., Band President.
Capt. W. E. Squire, M.B.E.

(1) Capt. W. E. Squire took his seat on appointment to the Committee vice Major E. P. Offord.

(2) The minutes of the last meeting held on June 31 were read and confirmed.

(3) *Officers' Branch. Band.*—The Secretary reported payment of £250, and Capt. Allnutt submitted and explained the accounts for the quarter ending September 30. The accounts were approved and the Secretary was directed to send a further cheque for £150. It was noted that this will make an amount of £400 out of the total of £600 authorized by the Annual General Meeting up till next June.

(4) *Dinner.*—The Secretary reported payment of all expenses connected with the annual dinner amounting to £452 2s. 3d., and that a small credit balance still remains in the accounts of the Dinner Fund.

(5) *Memorials.*—The Secretary reported payment of 100 guineas voted by the Annual General Meeting to the General Memorial Fund for all ranks of the Royal Army Medical Corps.

(6) The recommendations of the Sub-Committee regarding the inscription on the bronze tablet commemorating certain Officers distinguished in connexion with the formation of the Corps were considered, and a sketch prepared by the artist showing the proposed lettering, examined.

(i) After some discussion it was proposed by Colonel Robinson, and seconded by Colonel Hinge, "that the words recommended by the Sub-Committee for the inscription, viz:—

"From the	to those
Royal Army	who helped
Medical Corps	to make it."

should be approved. This was carried.

(ii) It was further decided that all the lettering shall be reduced in magnitude in order that if possible all the letters in the words "Medical Corps" shall be of equal size, and that the artist be requested to draft one or two alternative sketches.

(iii) The details to be left to the Sub-Committee to carry out.

(7) The report of the Sub-Committee on the progress made up to date in painting the series of V.C. pictures was read, and the action approved.

(8) *General Relief Branch.*—The following donations received since last meeting were reported, viz.:—

June 15	From	Officers' Branch by Annual General Meeting	£25	0	0
July 8	,,	U.S. Trustee from 55th Casualty Clearing Station	58	14	5
* ,, 9	,,	No. 20 Company Detachment at Fovant	30	3	1
September 1	,,	Rebate of Income duty last year	22	15	8
,, 1	,,	Aldershot Command, Royal Army Medical Corps Fund	1.000	0	0
* ,, 1	,,	Final payment on account of Prisoners of War Fund	1	5	0
,, 10	,,	43rd Casualty Clearing Station	14	0	10
* ,, 20	,,	U.S. Trustee from 15th Field Ambulance	25	17	9
			£1,178	5	9

* Proportion allotted to this Fund of larger cheques received, the balances of which have been allotted by the donors to other Funds.

(9) The following grants which have been made in urgent cases under Rule 9 were submitted and approved:—

June 29 and September 22	Mr. T. J., aged 60, advanced locomotor ataxia ..	£10 0 0
July 1 ,, August 25 ..	Mrs. S. A. W., widow, invalid with sick child, case recommended by C.O.S.	10 0 0
,, 1	Mrs. L. E. S., aged 75, and infirm, now in infirmary ..	3 0 0
,, 7	Mrs. R. B., aged 74, infirm, recommended by Sailors' and Soldiers' Families' Association	6 0 0
,, 7	Mr. M. K. Q., disseminated sclerosis	6 0 0
,, 10	Mrs. M. K. H., widow, aged 60, crippled with rheumatism	5 0 0
,, 14 ,, August 2 ..	Pte. E. S., invalided, grant for family recommended by C.O.S. whilst man is being trained for a tailor ..	10 0 0
,, 22 ,, September 10	Mrs. N. T., widow, unable to work on account of rheumatism and one son sick, C.O.S., Portsmouth ..	10 0 0
,, 28	F. C. D., temporary distress	5 0 0
,, 28	E. P., temporary grant to assist in stocking small farm —Sailors' and Soldiers' Help Society	5 0 0
August 5	E. C. A., invalided, grant to assist family in emigrating —Sailors' and Soldiers' Help Society	6 0 0
,, 11 and 23 ..	P. T. H., invalided, grant to pay arrears of Insurance Policies, etc.—Sailors' and Soldiers' Help Society ..	7 0 0
September 8	W. J. C., temporarily out of work with poisoned hand, C.O.S.	5 0 0
,, 8	Pte. S. T. B., temporarily sick, attending hospital—Sailors' and Soldiers' Help Society..	6 0 0
,, 14	A. T., crippled with osteo-arthritis, recommended by Local War Pensions Committee on account of increased rent	5 0 0
,, 19	F. E. H. and wife in immediate distress and out of work	2 0 0
,, 20	C. R., just out of hospital and waiting employment ..	4 0 0
,, 21	Mrs. E. P., widow, health indifferent, has lost two sons in the late war	5 0 0
,, 27	Pte. C. R. T., in temporary difficulties	1 0 0
		£109 0 0

(10) The Secretary reported the purchase of £843 1s. 1d. National War Loan for £718 16s. in accordance with the decision of the last meeting, and it was decided to invest a further sum of £1,000 in the same security.

(11) *Schools.*—The Secretary explained the scheme of the Aldershot Royal Army Medical Corps Fund by which a sum of £9,000 has been invested, the interest resulting therefrom to be paid regularly to the General Relief Branch. This annual interest is to be devoted solely to the education of children of Warrant Officers, Non-commissioned Officers and men of all branches of the Corps, and for this purpose half of the amount is to be transferred to the Relief Branch of the Auxiliary Royal Army Medical Corps Fund. It was decided that the whole scheme should be circulated to all members of the Committee and the subject considered at the next meeting.

(12) *General.*—The Secretary reported that a general index of important matters since the formation of the Fund had been completed for convenience of reference.

(13) The case of the widow of an Officer of the Corps in urgent temporary distress was considered. This lady has no children and is therefore ineligible for assistance from the Benevolent Society. A grant of £20 was authorized under Rule 5.

(14) Col. Hinge reported that a special bronze medal and diploma had been presented to the Corps by the Italian Government and was now in the College. He proposed that it should be suitably framed to correspond with a similar diploma presented at the time of the Messina earthquake, and that the cost—not exceeding £25—should be borne by the Fund. This was seconded by Col. Robinson and carried.

(15) The Secretary reported that the present cash balance in the Officers Branch was about £100, and he was directed to sell the remaining £500 National War Bonds, 1927, and transfer the proceeds to the current account.

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ROYAL ARMY MEDICAL CORPS BAND.

Statement of Accounts, July to September, 1920.

Receipts.	£	s.	d.	Expenditure.	£	s.	d.
Balance in hand	62	5	2	Band Pay	90	9	6
Grant from R.A.M.C. Fund	150	0	0	Salaries	53	19	8
Fees for Performances	40	0	0	Music and Repairs	32	4	8
				Insurance	2	17	9
				Travelling	2	1	6
				Band Fees for Performances	40	0	0
				Postage	0	9	0
				Total Expenditure	£222	2	1
				Balance in hand	30	3	1
Total	£252	5	2	Total	£252	5	2

Audited and found correct.
(Signed) F. H. M. CHAPMAN, *Major, R.A.M.C.*
L. HOBBS, *Lieut. R. Bde., att. Depot, R.A.M.C.*

Crookham Camp, Aldershot,
October 1, 1920.

E. B. ALLNUTT, *Captain.*
Adjutant, Depot R.A.M.C.

ROYAL ARMY MEDICAL CORPS OFFICERS' BENEVOLENT SOCIETY.

PROCEEDINGS OF A COMMITTEE MEETING HELD AT THE WAR OFFICE ON OCTOBER 6, 1920.

Present—

Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.S., Director-General, in the Chair.

Major-Gen. Sir W. Donovan, K.C.B.
Major-Gen. Sir H. R. Whitehead, K.C.B.
Major-Gen. Sir M. W. Russell, K.C.M.G., C.B.
Major-Gen. Sir G. B. Stanistreet, K.B.E., C.B., C.M.G.
Col. H. W. Murray.

(1) Apologies for absence were received from Lieut. Col. A. B. Cottell and Capt. J. T. Clapham.

(2) The minutes of the meeting held on June 21 were read and confirmed.

(3) The Secretary reported that all the grants had been paid, and letters of acknowledgment and thanks received from the recipients; also that by accident a donation had been made in a case where the maximum grant had already been given to another member of the same family. The explanation was accepted.

(4) The Secretary reported the issue of a grant of £15 under Rule 31 to the widow and five orphan children of a deceased officer. The action was approved and the Committee voted a further grant of £15 under Rule 24.

(5) The following donations which have been received since last meeting were reported:—

	£	s.	d.
From the Officers' Mess, Dartford War Hospital	£10	2	6
From the 44th General Hospital, Deolali	29	2	2
Refund of Income Tax for last year	211	6	0
	£250	10	8

(6) The Secretary reported that the special circular letter on the occasion of the centenary, and Banker's Order Forms had been reprinted at a cost of £2 3s. 9d. and issued to all officers recently commissioned. The number of new subscribers obtained in response to the appeal amounts at present to 154.

(7) The Secretary reported that as difficulty was occasionally experienced in tracing previous decisions, a General Index had been made of important matters from the five volumes of transactions since the foundation of the Fund for convenience of future reference.

(8) An application was considered from the guardian of an orphan for a small grant in aid of the expense of printing and distributing a card and circular appeal for votes for the election of the child to the Royal School at Bath. The Committee voted £10 under Rule 24.

ROYAL ARMY MEDICAL CORPS FUND.

At a joint meeting of the Royal Army Medical Corps Fund and the Royal Army Medical Corps Officers' Benevolent Society, held at the War Office on Wednesday, October 6, it was proposed by the Director-General, Sir T. H. J. C. Goodwin, and seconded by Major-General Sir W. Donovan on behalf of the Benevolent Society, and carried unanimously, that a message should be sent to Lady Babtie expressing the deepest sympathy of all the members on the terrible loss which she has recently sustained in the sudden death of her husband, the late Lieut.-General Sir W. Babtie, V.C., K.C.B., K.C.M.G

General Goodwin said that apart from the distinguished services which Sir W. Babtie had rendered to the War Office and the Army as a whole, the two Committees realized that they had lost one of their most valued colleagues, who had constantly taken the greatest interest in all matters connected with the Corps, and who had always been ready to give them the benefit of his advice and experience in anything that tended to advance the objects the two Societies have in view.

OBITUARY NOTICE.

LIEUT.-GEN. SIR WILLIAM BABTIE, V.C., K.C.B., K.C.M.G., LL.D., M.B.

Lieut.-Gen. Sir William Babtie died suddenly on September 11, at Knocke, Belgium, where he had been staying on a holiday visit. His body was brought home and an inquest was held on September 16. The evidence showed that his death was due to natural causes.

By his death the Corps has sustained a loss which will be felt for many years. There was no officer who possessed so extensive and deep a knowledge of the history of the Army Medical Service from its beginnings and of its relations to the Army as a whole: a knowledge which had been acquired by long and exhaustive study and which was coupled with an ardent love of his service and a strong desire to assist to the utmost of his power in its legitimate evolution. No labour to that end was too great, no detail too minute. He combined with his untiring industry the faculty of turning his knowledge to account and there are few of the advances of modern

years in the organization and equipment—the word is used in its widest sense—of the Corps in which he could not claim a conspicuous share. His mind was not wedded to the past; but the past showed him pitfalls to avoid and often gave him the signpost for the future, pointing the way to the accomplishment of reforms seemingly beset with great difficulties.

His natural aversion to personal publicity hid from many the great merit of his work. Time will reveal the influence he wielded and his renown, already great, will grow.

Sir William Babtie was born on May 7, 1859, at Dumbarton and was the eldest son of the late John Babtie, ex-Provost and J.P. of that town.

He was a graduate of the University of Glasgow, taking his M.B. in 1880 and the L.R.C.P. and S. of Edinburgh in the same year. In 1881 he entered the Army Medical Service. His record of services, promotions, appointments and distinctions is as follows:—

Ranks.

Surgeon-Captain, July 30, 1881.
Surgeon-Major, July 30, 1893.
Lieut.-Col. (special promotion for service in South Africa), November 29, 1900.
Colonel, March 12, 1907.
Surgeon-General, afterwards Major-General, December 11, 1911.
Temp. Lieutenant-General, March 1, 1918.
Retired pay and granted Honorary rank of Lieutenant-General, May 7, 1919.

Appointments.

Assistant-Director, afterwards Assistant-Director-General, 1901-1906.
Inspector of Medical Services, 1907-1910.
Deputy Director-General (with temp. rank of Surgeon-General), 1910-1914.
Honorary Surgeon to the King, June 16, 1914.
Director of Medical Services, March 22, 1914, to June 5, 1915, India.
Principal Director of Medical Services, Mediterranean, June 15, 1915, to March 10, 1916.
Director of Medical Services at War Office, March 18, 1916, to February 28, 1918.
Inspector of Medical Services, March 1, 1918, to May 6, 1919.

War Services.

South African War, 1899-1900.—Staff Officer to P.M.O. Natal. Relief of Ladysmith, including action at Colenso. Operations of January 17 to 24, 1900, and action at Spion Kop: operations of February 5 to 7, 1900, and action at Vaal Kranz; operations on Tugela Heights February 14 to 27, 1900, and action at Pieters Hill; operations in Natal March to June, 1900, including action at Laing's Nek June 6 to 9; operations in the Transvaal, east of Pretoria, July to November, 1900. Despatches—*London Gazette*, February 8, 1901. Promoted Lieutenant-Colonel, Queen's Medal with five clasps, V.C. The War of 1914-19. Despatches—*London Gazette*, May 5, 1916, K.C.M.G., K.C.B.

C.M.G.—June, 1899.
C.B.—June 14, 1912.
K.C.M.G.—January 1, 1916.
K.C.B.—June 9, 1919.

The official record of Babtie's services, ample and honourable as it is, gives but a faint reflection of the outstanding value of his work. The highest ideals were ever his incentive in all he undertook. To do, not only well, but the best, was his constant endeavour and success crowned his efforts, without impairing his innate modesty.

From his early years in the service he had steeped himself in the history of the Army and its component parts, he had explored its recessses and pondered over the lessons he had learned, thereby specially fitting himself for much of the work in which he afterwards became immersed. Knowledge was not pursued only for knowledge sake; but thought, clear and cogent, followed, and when the opportunity came action succeeded swift on thought. His first great opportunity came in Crete in 1889. Amongst other duties he was entrusted with the cleaning up of Candia, in the face of an apathetic or actively hostile and fanatical population. The promptitude, efficiency and success of his methods at once arrested the attention of his chiefs and from that date he became a marked man. For his services in Crete he was awarded the C.M.G., an honour in those days rarely given to officers of his seniority. Henceforward his talents became more and more in request for posts requiring administrative and executive capacity. His powers rapidly ripened and he showed that he had not only the imagination to conceive, but also the ability to present his ideas in convincing form and the resourcefulness and driving power necessary for their adequate execution.

In 1899 he was selected to proceed to South Africa as Staff Officer to the Principal Medical Officer in Natal. There he once more made his mark and was of inestimable worth to his chief in carrying through the numerous emergent measures rendered necessary by the vicissitudes of the campaign.

Here also his ideas as to many pressing reforms required in the organization of the medical service crystallized.

It was at Colenso that he gave proof of that daring initiative and high physical courage which were amongst his characteristics; physical courage matched by the moral courage he subsequently displayed on many occasions.

The following is the *Gazette* notification of the circumstances under which he won the most coveted of all military distinctions, the V.C.

(*London Gazette*, April 20, 1900): "At Colenso, on December 15, 1899, the wounded of the 14th and 66th Batteries, Royal Field Artillery, were lying in an advanced donga close in the rear of the guns without any medical officer to attend to them, and when a message was sent back asking for assistance, Major W. Babtie rode up under a heavy rifle fire, his pony being hit three times. When he arrived at the donga, where the wounded were lying in sheltered corners, he attended to them all, going from place to place exposed to the heavy rifle fire which greeted anyone who showed himself. Later on in the day Major Babtie went out with Captain Congreve to bring in Lieutenant Roberts who was lying wounded in the veld. This also was under heavy fire."

For his services in South Africa he was awarded well merited special promotion to Lieutenant-Colonel, and in 1901 on his return home was appointed D.A.D.G. at the War Office to assist in working out and carrying through the many reorganization projects which experience in the war had shown to be desirable and rendered practicable.

Some few months later a signal reorganization step within the medical department of the War Office itself was taken, when the affairs of the officer personnel of the medical service were entrusted to the care of an officer of the Corps. Up to this time they had been in the hands of a civil servant. The view had been long held that medical men were unfit to supervise their fellows, a view curiously fostered not only by many outside but by some within the fold. Babtie was translated to be the first officer head of the new model, and never was appointment better justified. He threw himself into the task with enthusiasm. It involved the creation of a new branch, and entailed an enormous amount of detailed work; but by his unwearying industry and application, firm grasp of broad principles and mastery of detail the mission was accomplished, and the foundations of the new regime were laid deep, true and broad; firm and wide enough to bear without creaking further developments which have since been built on it. A new spirit was breathed into the Corps as men gradually began to appreciate that their records were studied, their qualifications noted and that appointments were made with due regard to fitness. But the change might have failed of its purpose had it not been for the meticulous care and scrupulous fairness which Babtie brought to bear on its execution. Its success is his monument.

In the further reforms which marked the reorganization period after the South African War, Babtie bore his full share. To him fell in a large degree the staff work required for bringing the changes into operation. In this province his clear, cool, logical mind, his power of lucid exposition, his resourcefulness and his power of getting work done were of inestimable value. Few could equal his *flair* in dissecting a difficult problem and in finding and setting forth the most appropriate means for its solution. He seemed to see essentials by intuition; but it was an intuition based on wide knowledge and deep thought. In fact he had already ruminated over most contingencies and was ready with the key when the time came. Often by a telling phrase he would throw a flashlight on obscurity and make it clear as day.

When he left the War Office in 1906 he had founded a tradition in his branch which will not fade.

After his first period at Headquarters he was for a time in command of the Royal Herbert Hospital at Woolwich, where he made his presence felt by urging forward the accomplishment of the reforms incidental to the scheme of reorganization which had been adopted.

In 1907 he was appointed the first Inspector of Medical Services, an office which carried him to the furthest posts, outside India, of the British Army abroad and gave him a comprehensive view of the medical service as it then existed at home and abroad. In this appointment he was able to do much to level up the efficiency of outlying stations and the first-hand knowledge it gave him was of material help when he returned to Headquarters as Deputy Director-General in 1910.

In March, 1914, he was sent to India as Director of Medical Services. A few short months after his arrival the European war broke out and he was confronted with the triple task of supplying the medical arrangements for the largest overseas army that the country had ever sent abroad, of arranging for the medical service for an expedition to Mesopotamia to cover the Persian oil wells, and of maintaining in India a sufficient medical cadre to carry on the military medical service in that country where trouble was already brewing on the frontier. Such a contingency had not come within the calculations of the Indian Government, and adequate preparations to meet it were non-existent. It was mainly owing to Babtie's indomitable work that the difficulties were overcome.

As the European War progressed and developed in the Near East Babtie's services were requisitioned by the Home Authorities, and in the spring of 1915 he was called to Egypt on special service to deal with problems which had arisen there. In June of that year he was made Principal Director of Medical Services in the Mediterranean to co-ordinate the work in that area during the operations at Gallipoli, Salonica and in Egypt, and he did not return to India.

Meanwhile military affairs had developed in Mesopotamia beyond the limits originally contemplated and arranged for, and Babtie, because he had been for a time D.M.S. in India was held by the Commission which subsequently sat to be in some part responsible for the lamentable breakdown of the medical arrangements in the advance to the relief of Kut.

Those who knew the nature and circumstances of Babtie's work in India felt that the Com-

mission had been misled and had blundered, and there was little surprise when later the Ministerial representative of the War Office announced in the House of Commons that after full consideration of all the facts, the Army Council, to whom Babtie's case had been referred, had come to the conclusion that the explanation he had offered was satisfactory in all respects. At this period, before his vindication, Babtie, firm in his right but conscious of the undeserved slur which had been cast upon him, impressed all who came in contact with him by his quiet dignity and showed that he could

"Meet with triumph and disaster
And treat those two impostors just the same."

Once put right the incident was dismissed from his mind, and nothing rankled.

Subsequently, as Director of Medical Services at the War Office and Inspector of Medical Services, Babtie was enabled to perform duties of great importance, finding full scope for his talents and energy.

His retirement under the age clause did not put an end to his activities, as his counsel was still eagerly sought and freely given in connection with War Office Committees and problems of reorganization.

He had always shown himself a keen admirer of and helpful friend to the Nursing Service, a sympathy which was recognized by his appointment to a seat on the Nursing Board after his retirement.

A labour of love which he had set himself, and on which he was engaged up to his untimely death, was the bringing up to date and revision of his old friend, Colonel Johnston's "Roll of the Medical Services, 1727-1898," in the original preparation of which he had taken a share. It is to be hoped that his work in this field will not be lost.

As an official Babtie had many conspicuous qualities, not least amongst them being the happy faculty of inspiring those who worked with or under him with his own relentless industry and enthusiasm, earning at the same time not only their esteem, but their affection. On the other hand his chiefs have borne testimony to the loyal and unfailing help he rendered them.

In his private relations he was entirely lovable. He had a genius for lasting friendship. Friends once made he kept. His old University delighted to honour him, and he had friends among its graduates all over the kingdom. In the Corps he had troops who held him in affectionate regard. A marked trait in his character was his constant desire to help others, especially his brother officers, and many owe to him kindly services of which they are unaware. A friend to his Corps he was also a friend to every individual in it.

An officer of outstanding capacity, with vast and mellowed experience, deep erudition in the subjects he had made his own, and wide and kindly human sympathies, of him it may be truly said: "He was a man, take him for all in all, we shall not look upon his like again."

M. W. R.

MILITARY WIDOWS' FUND, BRITISH SERVICE.

The Military Widows' Fund, British Service, was established in India in 1820 to alleviate the distress of families of officers of the British Service, *serving in India*, and to enable them to return to England without unnecessary delay. Whenever an officer of the British Service, who is a subscriber to the Fund, dies, his family receives at once the following assistance, namely, six months' maintenance allowance ranging from Rs. 2,400 to Rs. 3,600 according to the rate subscribed, plus Rs. 1,500 as a donation for the widow, plus Rs. 500 or Rs. 300 as a donation for each child according to whether the child is over 12 and under 21 years of age or under 12 years of age. These benefits are secured by a small subscription of Rs. 4, 3 or 2 per mensem, which is regulated by the amount of pay an officer draws. An officer, on becoming a subscriber, secures for his wife and children quite irrespective of his length of service in India, the full benefits of the Fund in case of his death after having subscribed for fully three months. In the event of an officer dying within that period, his case is specially considered by the Committee of General Management.

Copies of the regulations of the Fund and other particulars relating thereto can be obtained from the Secretary at Simla.

BIRTHS.

HILL.—At 38, Burnbank Gardens, Glasgow, W., on September 25, to Mabel, wife of Capt. J. R. Hill, R.A.M.C., a son.

PANTON.—At Famagusta, Cyprus, on July 19, 1920, the wife of Capt. and Brevet Major H. F. Panton, D.S.O., M.C., Royal Army Medical Corps, of a son.

MARRIAGE.

McNAUGHTAN—KINLOCH.—At St. George's Parish Church, Edinburgh, on September 29, Capt. (Brevet Major) W. McNaughtan, O.B.E., Royal Army Medical Corps, to Peggy, daughter of Charles Kinloch, Esq., Corner House, Queensferry Road, Edinburgh.

ROYAL ARMY MEDICAL COLLEGE.

LIST OF BOOKS ADDED TO THE LIBRARY DURING THE MONTHS OF JULY, AUGUST AND SEPTEMBER, 1920.

Title of Work and Author	Edition	Date	How obtained
Cerebro-spinal Fluid in Health and Disease. By A. Levinson, B.S., M.D.		1919	Library Grant.
Physiological Principles in Treatment. By W. Langdon Brown, M.A., M.D.	4th	1920	,, ,,
War against Tropical Disease. By Andrew Balfour, C.B., C.M.G., M.D.		1920	,, ,,
The Pituitary. By W. Blair Bell		1919	,, ,,
Marine Hygiene and Sanitation. By Gilbert E. Brooke, M.A.		1920	,, ,,
Ozone. By E. K. Rideal, M.B.E., M.A., Ph.D.		1920	,, ,,
Preventive Medicine and Hygiene. By Milton J. Rosenau	3rd	1918	,, ,,
Roentgen Interpretation. By Holmes and Ruggles ..		1919	,, ,,
The House Fly: its Life-History and Practical Measures for its Suppression. By Major E. E. Austen, D.S.O.		1920	,, ,,
An Introduction to the Study of Cytology. By L. Doncaster, Sc.D., F.R.S.		1920	,, ,,
A Text-Book of Pathology. By Delafield and Prudden..	11th	1920	,, ,,
Malaria at Home and Abroad. By Lieut.-Col. S. P. James, M.D., I.M.S.		1920	,, ,,
Elementary Lessons in Electricity and Magnetism. By Silvanus P. Thompson, F.R.S.		1919	,, ,,
Introduction to Physical Chemistry. By James Walker, F.R.S.	8th	1919	,, ,,
Pellagra. By H. F. Harris, M.D.		1919	,, ,,
Essays on the Surgery of the Temporal Bone. 2 vols. By Sir Charles A. Ballance, K.C.M.G., C.B.		1919	,, ,,
Iron Bacteria. By David Ellis, D.Sc., Ph.D.		1919	,, ,,
Essentials of Physiology. By Bainbridge and Menzies..	3rd	1919	,, ,,
X-Rays. By G. W. C. Kaye, M.A., D.Sc...	3rd	1918	,, ,,
The Child Welfare Movement. By Janet E. Lane-Claypon, M.D., D.Sc.		1920	,, ,,
The Extra Pharmacopœia. By Martindale and Westcott. Vol. i	17th	1920	,, ,,
Public Health Laboratory Work (Chemistry). By Henry R. Kenwood, C.M.G., F.R.S.E.	7th	1920	,, ,,
Text-Book of Public Health. By E. W. Hope, M.D., D.Sc.	8th	1919	,, ,,
The Medical Annual: a Year-Book of Treatment		1920	,, ,,
Wheeler's Handbook of Medicine. By William R. Jack, B.Sc., M.D.	6th	1920	,, ,,
A Manual of Venereal Diseases for Students. By Brevet Col. L. W. Harrison, D.S.O., R.A.M.C.		1920	,, ,,
Common Infections of the Kidneys. By Frank Kidd, M.B., B.C.		1920	,, ,,
Cunningham's Manual of Practical Anatomy. Vol. ii. Revised and edited by Arthur Robinson	7th	1920	,, ,,
X-Ray Diagnosis and Treatment. By Bythell and Barclay		1912	,, ,,
Food Inspection and Analysis. By Albert E. Leach, S.B. Revised by A. L. Winton, Ph.D.	4th	1920	,, ,,
Bacteriology and Mycology of Foods. By F. W. Tanner, M.S., Ph.D.		1919	,, ,,
Neoplastic Diseases. By James Ewing, A.M., M.D. ..		1919	,, ,,
Surgical Shock and the Shockless Operation. By Crile and Lower	2nd	1920	,, ,,

LIST OF BOOKS ADDED TO THE LIBRARY—*Continued.*

Title of Work and Author	Edition	Date	How obtained
Microscopy: the Construction, Theory and Use of the Microscope. By Edmund J. Spitta	3rd	1920	Library Grant.
Handbook of Physiology. By W. D. Halliburton, M.D., F.R.S.	15th	1920	,, ,,
Science and Life. By Frederick Soddy, M.A., F.R.S. ..		1920	,, ,,
The Radium Institute, London. A Report of the Work from January 1, 1919, to December 31, 1919		1920	,, ,,
Dent's Scientific Primers:—			
Geology. By J. W. Gregory, F.R.S.			
Physiology. By W. D. Halliburton, F.R.S... ..		1920	
Physiological Histology. By Gustav Mann, M.D. ..		1902	,, ,,
Manual for Health Visitors, School Nurses, and Teachers of Hygiene. By O. Hall		1916	,, ,,
Realities of War. By Philip Gibbs..		1920	,, ,,
Life of Lord Kitchener. By Sir George Arthur. 3 vols.		1920	,, ,,
Indiscretions of the Naval Censor. By Rear-Admiral Sir Douglas Brownrigg, Bart.		1920	,, ,,
Record of the Advance of the Egyptian Expeditionary Force, July, 1917, to October, 1918	2nd	1919	,, ,,
Aids to Electro-Therapeutics. By J. Magnus Redding, F.R.C.S.		1920	Editor, Journal.
Electric Ionization. By A. R. Frier, M.A., M.D. ..		1920	,, ,,
Handbook of Diseases of the Nose, Throat and Ear. By W. S. Syme, M.D.		1920	,, ,,
The Link between the Practitioner and the Laboratory. By Fletcher and McLean		1920	,, ,,
The Doctor's Manual or Practitioner's Vade-Mecum. By A. Herbert Hart, M.S.	4th	1920	,, ,,
A Text-Book of Ophthalmic Operations. By Grimsdale and Brewerton	2nd	1920	,, ,,
Radiography in the Examination of the Liver, Gall Bladder, and Bile Ducts. By Robert Knox, M.D.		1919	,, ,,
Manual of Tropical Medicine. By Castellani and Chalmers	3rd	1919	,, ,,
Atlas for Electro-Diagnosis and Therapeutics. By F. Miramond de Laroquette, M.D. Translated by Mary Gregson Cheetham		1920	,, ,,
Clinical Methods. By Hutchison and Rainy	7th	1920	,, ,,
Modern Anæsthetics. By J. F. W. Silk, M.D.	3rd	1920	,, ,,
Muncipal Council of Johannesburg. Report of the Medical Officer of Health on the Public Health and Sanitary Circumstances of Johannesburg during the three years, July 1, 1916—June 30, 1919. By Charles Porter, M.D., D.P.H.		1920	,, ,,
A Manual of War Surgery. By Barling and Morrison ..		1919	,, ,,
Medical Research Council, Special Report Series:—			
No. 51. The Laboratory Diagnosis of Acute Intestinal Infections, including the Principles and Practice of the Agglutination Test		1920	,, ,,
No. 52. The Science of Ventilation and Open-Air Treatment. Part 2		1920	,, ,,
No. 53. The Medical Problems of Flying		1920	,, ,,
No. 54. The Diagnosis and Treatment of Peripheral Nerve Injuries		1920	,, ,,
Dardanelles Commission. First Report and Supplement		1917	War Office
Final Report of the Dardanelles Commission (Part II, Conduct of Operations, etc.). With Appendix of Documents and Maps		1917	,, ,,
History of the Asylum War Hospitals in England and Wales. Report to the Secretary of State for the Home Department. By Sir Marriott Cooke, K.B.E., M.B., and C. H. Bond, C.B.E., M.D.		1920	,, ,,

List of Books added to the Library—*Continued.*

Title of Work and Author	Edition	Date	How obtained
Ministry of the Interior, Egypt. Department of Public Health. Reports and Notes of the Public Health Laboratories, Cairo. No. 3. Egyptian Water Supplies		1920	Commandant's Office.
Report on the Jail Administration of the Province of Assam for the year 1919. By the Hon. Col. J. Garvie, I.M.S.		1920	India Office
Statistical Returns of the Lunatic Asylums in the Madras Presidency for the Year 1919		1920	,, ,,
Report on the Working of the Junjab Lunatic Asylum for the year 1919		1920	,, ,,
Report of the Chemical Examiner to the Government, Punjab, for the year 1919		1920	,, ,,
Annual Returns of the Civil Hospitals and Dispensaries in the Madras Presidency for the year 1918		1919	,, ,,
Triennial Report on the Lunatic Asylums in the United Provinces of Agra and Oudh, for the years 1915, 1916 and 1917		1918	,, ,,
Report of the Chemical Examiner to Government, North-West Province, for the year 1919		1920	,, ,,
Annual Sanitary Report of the Province of Assam for the year 1919		1920	,, ,,
Annual Returns of the Lunatic Asylums in Bihar and Orissa, with Brief Notes for the year 1919		1920	,, ,,
Triennial Report on the Working of the Dispensaries in Assam for the years 1917, 1918 and 1919. By the Hon. Col. J. Garvie, I M.S.		1920	,, ,,
Report on the Sanitary Administration of the Punjab, and Proceedings of the Sanitary Board for the year 1919. By Lieut.-Col. W. H. C. Foster, I.M.S., and the Report on the Sanitary Works for 1919. By Mr. A. R. Astbury		1920	,, ,,
Report on the Working of the Jails in the Punjab, 1919 ..		1920	,, ,,
Triennial Vaccination Report of the Province of Assam for the years 1917-18, 1918-19, and 1919-20. With Brief Explanatory Notes. By Major T. C. McCombie Young, I.M.S.		1920	,, ,,
Reports of the Chemical Analysers to Government, Bombay and Sind, 1919		1920	,, ,,
Commonwealth of Australia, Quarantine Service. Service Publication No. 16. Maritime Quarantine Administration		1919	Director of Quarantine Administration, Australia.
Office International D'Hygiène Publique, May, June, July and August		1920	The Secretary, Ministry of Health.
Journal of the Royal Naval Medical Service. Vol. vi. No. 3, July		1920	Editor, Journal.
The *Medical Officer*, July 3 to September 25		1920	,, ,,
The *Japan Medical World*, June 5 to August 21		1920	The Director.
London County Council. Report of the County Medical Officer of Health and School Medical Officer for the year 1919		1920	Clerk of the Council
The *International Journal of Public Health*, vol. i, No. 2, September		1920	The Publishers
Man: a Monthly Record of Anthropological Science, July, August and September		1920	Presented by Col. S. L. Cummins, C.B., C.M.G.
The *Geographical Journal*, July, August and September		1920	Presented by Col. R. J. S. Simpson, C.B., C.M.G.
Arterio-Sclerosis and the Eye. (Reprint.) By P. H. Adams, M.B., F.R.C.S.		1920	Presented by Sir F. A. Bradshaw, K.C.B.

EXCHANGES, &c.

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Notices.

EDITORIAL NOTICES.

The Editor will be glad to receive original communications upon professional subjects, travel, and personal experiences, etc. He will also be glad to receive items of news and information regarding matters of interest to the Corps from the various garrisons, districts, and commands at home and abroad.

All such Communications or Articles accepted and published in the "Journal of the Royal Army Medical Corps" will (unless the Author notified at the time of submission that he reserves the copyright of the Article to himself) become the property of the Library and Journal Committee, who will exercise full copyright powers concerning such Articles.

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JOURNAL

OF THE

ROYAL ARMY MEDICAL CORPS.

Corps News.

DECEMBER, 1920.

EXTRACTS FROM THE "LONDON GAZETTE."

COPY OF CORPS ORDERS, DATED OCTOBER 1, 1920.

MERITORIOUS SERVICE MEDAL.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the undermentioned Warrant Officer and Non-Commissioned Officers in recognition of valuable services rendered in India in connexion with the War, dated June 3, 1919.

(Supplement to the *London Gazette*, dated September 3, 1920).

37070 Staff-Serjt. (Acting Qmr.-Serjt.) F. W. Shaw.
36457 Serjt. W. Hall.
18301 Serjt. (Acting Staff-Serjt.) C. J. Molden.

DECORATIONS AND MEDALS AWARDED BY THE ALLIED POWERS.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the Campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

(Supplement to the *London Gazette*, dated August 18, 1920).

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE BELGIANS.

Medaille Civique—1st Class.

1157 Pte. (Temp. Cpl.) A. E. Gray.

Medaille de l'Assistance Publique. En Bronze

135043 Pte. M. O'Toole.
71723 Pte. R. Poots.

(Supplement to the *London Gazette*, dated September 30, 1920).

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF SERBIA.

Samaritan Cross.

5250 Serjt. H. T. King.
4854 Pte. (Acting Serjt.) J. J. O'Donnell.

War Office,
October 15, 1920.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the decorations and medals in question.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF THE SERBS, CROATES AND SLOVENES.

Order of the White Eagle.

ROYAL ARMY MEDICAL CORPS.

5th Class.—Brevet Major William Bentley Purchase, M.C.

Order of St. Sava.

ROYAL ARMY MEDICAL CORPS.

3rd Class.—Brevet Col. Harold Hugh Norman, M.B.; Temp. Major (Acting Lieut.-Col.) Henry William Marett Tims, O.B.E., M.D.

ROYAL ARMY MEDICAL CORPS (TERRITORIAL FORCE).

3rd Class.—Lieut.-Col. Robert James William Oswald, O.B.E.; Lieut.-Col. Alexander Brodie Seton Stewart, O.B.E., T.D.; Lieut.-Col. Sir Nestor Isidor Charles Tirard, Knt., M.D.

ROYAL ARMY MEDICAL CORPS.

4th Class.—Temp. Capt. Augustus William Tabuteau, F.R.C.S.I.
5th Class.—Temp. Capt. Eustace Robert Barton.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace,
October 20, 1920.

The King has been graciously pleased to give orders for the following appointment to the Most Excellent Order of the British Empire, on the recommendation of the General Officer Commanding-in-Chief, British Army of the Black Sea, in recognition of valuable services rendered in connexion with military operations in South Russia. To be dated July 9th, 1920:—

To be a Commander of the Military Division of the said Most Excellent Order:—

Lieut.-Col. Horace Samson Roch, C.M.G., D.S.O., Royal Army Medical Corps.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.1.
October 20, 1920.

The King has been graciously pleased to give orders for the following appointment to the Most Excellent Order of the British Empire, for valuable services rendered in connexion with military operations with the Army of the Black Sea. To be dated September 24, 1920:—

To be an Officer of the Military Division of the said Most Excellent Order:—

Temp. Capt. (Acting Major) Hugh George, M.C., Royal Army Medical Corps.

CENTRAL CHANCERY OF THE ORDERS OF KNIGHTHOOD.

St. James's Palace, S.W.
October 20, 1920.

The King has been graciously pleased to give orders for the following appointment to the Most Excellent Order of the British Empire, in recognition of valuable services rendered in the Field, and brought to notice in accordance with the terms of Army Order 193 of 1919. To be dated May 6, 1919:—

To be an Officer of the Military Division of the said Most Excellent Order:—

Acting Major William Anderson, Royal Army Medical Corps (Salonika).

War Office,
October 28, 1920.

His Majesty the King has been graciously pleased to approve of the award of the Meritorious Service Medal to the undermentioned Non-commissioned Officers and Men, in recognition of valuable services rendered with the British Military Mission, South Russia:—

ROYAL ARMY MEDICAL CORPS.

19150 Temp. Staff-Serjt. T. H. Messenger (Maske-by-Sea).
200238 Cpl. F. W. Day (Hove).
200971 Cpl. (Acting Serjt.) C. E. Rendell (Swindon).
205136 Pte. J. Givens (Plymouth).
205128 Pte. (Acting Cpl.) A. H. Hall (East Cowes).
205237 Pte. J. Roberts (Llangollen).
200737 Pte. A. H. Shore (Southsea).
200526 Pte. (Acting Cpl.) N. Smith (Chelsea).
1799 Pte. (Acting-Serjt.) S. A. Stowe (Notting Hill).

AMENDMENTS.

The following are the correct descriptions of the undermentioned Non-commissioned Officers whose names have appeared in the *London Gazette* indicated for award of the Military Medal or Meritorious Service Medal:—

Military Medal.

London Gazette, dated August 30, 1919. 390057 Staff-Serjt. J. R. Glenton, Royal Army Medical Corps.

Meritorious Service Medal.

London Gazette, dated January 18, 1919. 403319 Cpl. G. H. Squire, Royal Army Medical Corps.

France.

London Gazette, dated June 3, 1919.
341287 Qmr.-Serjt. (Acting Serjt.-Major) G. Goodall, Royal Army Medical Corps.
26004 Cpl. (Lance-Serjt.) H. E. Kincaid, Royal Army Medical Corps.

Home.

London Gazette, dated September 22, 1919. 81245 Serjt. (Acting Serjt.-Major) R. L. Blyth, Royal Army Medical Corps. (Gazetted as Blythe.)

DELETIONS.

Meritorious Service Medal.

London Gazette, dated December 12, 1919. 493013 Qmr.-Serjt. W. A. Davies, Royal Army Medical Corps. (Duplicate award.)

War Office,
October 29, 1920.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question.

DECORATIONS CONFERRED BY HIS MAJESTY THE KING OF ITALY.

Order of the Crown of Italy.

Cavalier.—Lieut. Raymond Theodore Fred Barnett, Royal Army Medical Corps (Territorial Force).

Silver Medal della Salute Publica.

Brevet Lieut.-Col. John Grenville Bell, D.S.O., M.B., Royal Army Medical Corps.
Col. John Vincent Forrest, C.B., C.M.G., M.B.
Temp. Capt. Wyndham Parker, M.C., M.B., Royal Army Medical Corps.
Lieut.-Col. James Currie Robertson, C.M.G., C.I.E., C.B.E., M.B., Indian Medical Service.
Col. John Charles Baron Statham, C.M.G., C.B.E.
Lieut.-Col. John Weir West, C.M.G., M.B., Royal Army Medical Corps.

DECORATIONS CONFERRED BY HIS MAJESTY THE MAHARAJADHIRAJA OF NEPAL.

Order of the Star of Nepal.

3rd Class.—Lieut.-Col. (Acting Col.) Thomas Howard Foulkes, C.I.E., F.R.C.S., Indian Medical Service.
Lieut.-Col. John Wemyss Grant, M.B., Indian Medical Service.

War Office,
November 5, 1920.

The following are among the Decorations and Medals awarded by the Allied Powers at various dates to the British Forces for distinguished services rendered during the course of the campaign:—

His Majesty the King has given unrestricted permission in all cases to wear the Decorations and Medals in question:—

DECORATIONS CONFERRED BY THE PRESIDENT OF THE FRENCH REPUBLIC.

Legion d'Honneur.

Commandeur.—Lieut.-Gen. Sir Thomas Herbert John Chapman Goodwin, K.C.B., C.M.G., D.S.O., K.H.S.

Croix de Guerre.

Capt. Robert Burgess, D.S.O., M.C., Royal Army Medical Corps (Territorial Force). (3rd Award.)
Lieut.-Gen. Sir Charles Henry Burtchaell, K.C.B., C.M.G., M.B., K.H.S.
Temp. Capt. (Acting Major) Trevor Abbott Lawder, M.B., Royal Army Medical Corps. (3rd Award.)
Temp. Capt. Frank Percival Montgomery, M.C., M.B., Royal Army Medical Corps. (2nd Award).
Capt. Acting (Major) Peter John Ryan, M.C., M.B., Royal Army Medical Corps. (3rd Award.)
Temp. Capt. (Acting Major) Frederick Butwell Winfield, Royal Army Medical Corps. (2nd Award.)

Médaille d'Honneur avec glaives "en vermeil."

Temp. Capt. Alexander Sandison, Royal Army Medical Corps.
Temp. Capt. Arthur Hurrell Style, M.D., Royal Army Medical Corps,

Médaille d'Honneur avec glaives "en argent."

82160 Serjt. John Alexander Davidson, Royal Army Medical Corps (Salisbury).
35036 Staff-Serjt. Thomas Heredge, Royal Army Medical Corps (West Ealing, W.).
528567 Serjt. Ernest James Ernest Jones, 6th London Field Ambulance, Royal Army Medical Corps (Territorial Force), (Dulwich, S.E.).
31050 Staff-Serjt. John Kennedy Niven, Royal Army Medical Corps (Hampstead, N.W.).

Médaille de Honneur avec glaives "en bronze."

92566 Cpl. Thomas Pearson, Royal Army Medical Corps (Wakefield).
37961 Cpl. Thomas Pugh, Royal Army Medical Corps (St. Luke's, London, E.C.).

ARMY MEDICAL SERVICE.

Temp. Col. Sir W. Taylor, K.B.E., C.B., M.D., F.R.C.S.I., relinquishes his commission, 28th September, 1920, and retains the rank of Colonel.

The date on which Temp. Col. Sir W. Taylor, K.B.E., C.B., M.D., F.R.C.S.I., relinquished his commission is September 29, 1920, and not as in the *Gazette* of October 12, 1920.

Col. Lancelot P. Moore, M.B., from the half pay list, is restored to the establishment, dated October 12, 1920.

Lieut.-Col. Sydney G. Butler, D.S.O., retires on retired pay, November 9, 1920, and is granted the rank of Colonel.

ROYAL ARMY MEDICAL CORPS.

The undermentioned relinquish the acting rank of Lieutenant-Colonel:—
Dated June 8, 1919.—Major and Brevet Lieut.-Col. Charles H. Turner, D.S.O.
Dated January 31, 1920.—Major Thomas J. Wright, D.S.O. (Substituted for the notification in the *Gazette* of September 30, 1920.)
Dated May 21, 1920.—Temp. Capt. Frederick R. Kirkham, M.B.

The undermentioned Lieutenant-Colonels retire on retired pay:—
Dated November 1, 1920.—Thomas McDermott, O.B.E., M.B.
Dated November 13, 1920.—John Hay Campbell, C.B.E., D.S.O.; John Grech, D.S.O.; Frederic Harvey.

The undermentioned Temporary Lieutenants relinquish their commissions and retain the rank of Lieutenant:—
Dated July 15, 1920.—Abraham M. Moll, M.B.
Dated August 12, 1920.—John V. Coglan, Maurice J. Woodberg.
Dated August 13, 1920.—David P. Fitzgerald, M.B.

The undermentioned to be Temporary Lieutenants:—
Dated September 21, 1920.—Robert Milne Walker, M.D.
Dated September 25, 1920.—Charles William Bennett.
Dated September 29, 1920.—James William Hancock Steil, M.B.
Dated October 1, 1920.—Samuel Ernest Price.
Dated October 2, 1920.—Charles Percival Ruel.
Dated October 9, 1920.—George Alwyn Clarkson, F.R.C.S.
Dated October 18, 1920.—Joseph Henry Howitt.

The undermentioned Majors retire on retired pay:—
Dated November 13, 1920.—Arthur B. Smallman, C.B.E., D.S.O., M.D., and is granted the rank of Lieutenant-Colonel; Alfred W. A. Irwin, O.B.E.; Frederick A. Stephens, D.S.O.

The undermentioned relinquish the acting rank of Major:—
Dated August 2, 1918.—Temp. Capt. Alexander W. Uloth.
Dated February 28, 1919.—Temp. Capt. Alexander C. Sturrock.
Dated March 23, 1919.—Temp. Capt. James T. P. Wilson, M.D., F.R.C.S.
Dated May 1, 1919.—Capt. Clark Nicholson, M.C., M.B. (Substituted for the notification in the *Gazette* of May 3, 1920.)
Dated January 5, 1920.—Capt. Manfred Morris, M.B.; Capt. Walter E. Adam, M.C., M.D.
Dated March 2, 1920.—Capt. Oscar Williams.
Dated March 26, 1920.—Temp. Capt. John T. McCullagh, M.B.
Dated May 6, 1920.—Capt. John M. Weddell.
Dated June 5, 1920.—Capt. Henry R. L'Estrange, O.B.E.
Dated July 20, 1920.—Capt. Lionel B. Clarke.
Dated August 4, 1920.—Temp. Capt. Herbert A. Tillman, M.D.
September 10, 1920.—Capt. Stuart D. Robertson, M.B.

The undermentioned to be acting Majors:—
From February 25 to October 25, 1918, and from June 7 to September 8, 1919.—Capt. William M. Dickson, M.B.

Dated April 11, 1920.—Capt. and Brevet Major John D. Bowie, D.S.O., M.B.
From June 23 to August 3, 1920.—Capt. P. G. Tuohy, M.B.

The undermentioned Captains relinquish their Army commissions on appointment to permanent commissions in the Royal Air Force:—
Dated July 13, 1920.—Kenneth Biggs, M.C.
Dated August 1, 1920.—William W. Shorten.

The undermentioned Captains relinquish their commissions and are granted the rank of Major:—
Dated April 1, 1920.—Cecil S. Staddon, M.C.: William J. Webster, M.C., M.B.
Dated August 1, 1920.—Brevet Major Bertram Shires, M.B.

The undermentioned Captains relinquish their Army commissions on appointment to commissions in the Royal Air Force:—
Dated July 13, 1920.—Robert E. Bell, M.B.; Frederick J. Murphy, M.B.

The undermentioned Captains relinquish their commissions and retain the rank of Captain:—
Dated April 1, 1920.—Arthur K. Gibson, M.B.; Rollo Isbister, M.B.; Robert C. Davonport; Ivor Aubrey, M.C.; John B. Leigh, M.B.; Harold B. Dykes, M.B.; Aneurin E. Jenkins; Edmund Kean, M.B.; Philip M Neighbour.
Dated April 8, 1920.—John S. White, M.B.
Dated May 3, 1920.—William J. Harvey, M.B.
Dated May 8, 1920.—Douglas A. Dyer.
Dated May 20, 1920.—John Scott, M.B.
Dated May 28, 1920.—Andrew W. Smith, M.B.
Dated July 4, 1920.—Arthur A. Prichard.
Dated July 22, 1920.—Alexander F. Cook, M.B. (since deceased).
Dated July 30, 1920.—Wyndham Williams, M.B.; Paul Shillito, M.B.; George E. Tilsley.
Dated July 31, 1920.—Trevor A. Butcher, O.B.E.
Dated August 3, 1920.—Alexander C. Hill, M.B.
Dated August 4, 1920.—Arthur Bullied; Henry J. Parish, M.B.
Dated August 13, 1920.—Eric B. Hickson; George F. Mitchell, M.B.; William Adams, M.B.; Williams A. Jackson, M.B.; James S. McL. Gray, M.B.
Dated August 17, 1920.—John A. Martin.
Dated August 29, 1920.—Anthony Blackstock.
Dated September 2, 1920.—Robert P. Jack, M.B.
Dated September 7, 1920.—William L. Yell, M.B.; Kenneth J. A. Gillanders, M.B,; Arthur S. Westmorland.
Dated September 13, 1920.—Eric D. Spackman.
Dated September 15, 1920.—John A. Dawson.
Dated September 18, 1920.—Arthur G. Shurlock.
Dated September 27, 1920.—James O. P. Smith, M.B.; John P. J. Jenkins.
Dated September 29, 1920.—John F. Campbell; John W. Mackay, M.B.; William H. Simmons.
Dated October 6, 1920.—William Young, M.B.
Dated October 8, 1920.—Frank Portas.
Dated October 10, 1920.—Clifford V. Braimbridge.
Dated October 12, 1920.—Andrew Fowler, M.B.
Dated October 17, 1920.—Charles Simpson, M.B.

The undermentioned Temporary Captains relinquish their commissions and are granted the rank of Major:—
Dated September 23, 1920.—Patrick McCool, M.B.
Dated September 24, 1920.—Harry M. Grey.

The undermentioned late Temporary Captains to be Temporary Captains:—
Dated September 24, 1920.—Thomas Barker Amyand Haggard, with seniority from September 14, 1916.
Dated September 28, 1920.—Charles George Monro, M.B., with seniority from June 4, 1916.
Dated October 4, 1920.—John Graham Castellian, with seniority from April 18, 1916.
Dated October 12, 1920.—Ernest Osmond Gilkes, with seniority from May 17, 1916.
Dated October 20, 1920.—Charles Lyon Herklots, with seniority from June 1, 1915; Abram Leach, M.B., with seniority from October 14, 1915.
Dated October 25, 1920.—Thomas Brodie, M.B., with seniority from October 10, 1918.
Dated October 26, 1920.—Barron Norman Sinclair, M.B., with seniority from November 7, 1915.

The undermentioned to be Temporary Captains:—
Dated September 20, 1920.—Temp. Lieut. William F. Gardener.
Dated September 24, 1920.—Samuel Priestley Hyam, M.B., with seniority from July 15, 1918.
Dated October 5, 1920.—Charles Edmund Hibbard, late Temporary Captain, with seniority from November 2, 1914.

Dated October 6, 1920.—Samuel Alexander McClintock, M.D., late Temporary Lieutenant.
Dated October 7, 1920.—Frank Lindsay Dickson, M.B.
Dated October 11, 1920.—Rowland William Collum.
Dated October 12, 1920.—Henry Edward Montgomery Baylis, M.B., late Temporary Captain, with seniority from May 14, 1918; Bernard Hale Woodyatt, late Temporary Captain, with seniority from May 28, 1917.

The undermentioned Temporary Captains relinquish their commissions:—
Dated September 19, 1920.—George W. B. Waters, and is granted the rank of Major.
Dated September 25, 1920.—Harry S. Laird, and is granted the rank of Major.
Dated October 1, 1920 —Temp. Capt. Thomas J. Richardson, M.B.; Roderick A. Steven, M.B., and is granted the rank of Major.
Dated October 4, 1920.—Brevet Major William B. Purchase, M.C., and retains the Brevet rank of Major.
Dated October 22. 1920.—Arthur W. Wilcox, and is granted the rank of Major.

The undermentioned relinquish their commissions:—
Dated February 14, 1919.—Temp. Capt. Francis Dugon, and retains the rank of Captain.
Dated May 7, 1920.—Temp. Capt. (Acting Major) Bertram J. Collingwood, O.B.E., M.D., and is granted the rank of Major.
Dated September 1, 1920.—Temp. Major Henry M. Rashbrook, on ceasing to be employed with the Edmonton War Hospital, and retains the rank of Major.
Dated September 29, 1920.—Temp. Hon. Capt. Halcyon Halsted, and retains the hon. rank of Captain.
Dated September 30, 1920.—Temp. Major (Acting Lieut-Col.) Henry W. M. Tims, O.B.E., M.D., and is granted the rank of Lieutenant-Colonel.
Dated October 7, 1920.—Temp. Lieut. Thomas W. Smart, M.B., and retains the rank of Lieutenant.

The undermentioned Temporary Captains relinquish their commissions, and retain the rank of Captain:—
Dated July 18, 1918:—Edward R. Tweed, M.D.
Dated January 12, 1919.—John McLaw, on ceasing duty with South African Native Labour Corps.
Dated June 16, 1919.—Nathan N. Haysom.
Dated July 5, 1919.—Hugh F. Sheldon.
Dated January 7, 1920.—Hubert Joslen, M.D.
Dated February 15, 1920.—James F. Blackett, M.D.
Dated June 28, 1920.—John R. Howitt, M.B.
Dated June 29, 1920.—Alexander F. Campbell, M.B.
Dated July 11, 1920.—Arthur H. Priestley, M.B.
Dated July 28, 1920.—Alfred W. Popert.
Dated August 1, 1920.—Edwin F. O'Conner, M.B.
Dated August 4, 1920.—Charles S. Stolterfoth; James J. Foley; Peter P. Galea, M.D.
Dated August 6, 1920.—Strutt F. Cheesman; William B. Honey, M.D.
Dated August 10, 1920.—Thomas S. Paterson, M.B.
Dated August 11, 1920.—Daniel Cowin, M.B.
Dated August 26, 1920.—John Macqueen, M.B.; William P. H. Lightbody; William K. Bigger, M.C.
Dated September 1, 1920.—Robert W. Brown, M.B.
Dated September 11, 1920.—James N. Turnbull, M.B., F.R.C.S.; James T. Macnamara.
Dated September 12, 1920.—Frank E. Johnson; Thomas H. F. Roberts.
Dated September 13, 1920.—Bartholomew Langran.
Dated September 14, 1920.—Cecil W. C. Robinson.
Dated September 15, 1920.—Robert J. Allsopp, M.B.
Dated September 16, 1920.—Edgar Duke, M.B.; Thomas P. Noble; Peter C. C. Smith, M.D.; Gordon N. Brandon.
Dated September 17, 1920.—Arthur C. Freeth, M.B.; Henry H. Castle; David Gaston, M.B.; Walter Mercer, M.B.; Stuart Oliver; Joseph Maguire; Evan H. Jones, M.B.; Herbert R. Mayo, M.B.
Dated September 18, 1920.—Albert E. Wynne, M.D., F.R.C.S.: Arthur G. Welsford, M.D., F.R.C.S.
Dated September 19, 1920.—John Elliott; John O. Garland; Arthur H. Ward, F.R.C.S.; Archibald Chalmers, M.B.; James Byrne.
Dated September 21, 1920.—Edmund F. Lawson, M.B.; Edward T. Larkam, M.D.
Dated September 22, 1920.—Robert M. Hume, M.B.; Albert Leigh.
Dated September 23, 1920.—James K. Manson, M.B.; Hugh L. Sells, M.B.; James L. Stewart, D.S.O., M.C., M.B.
Dated September 25, 1920.—Hight Blundell, M.D.: Robert R. Pirrie, M.D.
Dated September 26, 1920.—William S. King, M.B.

Dated September 28, 1920.—Harold J. Cundell.

Dated September 29, 1920.—James T. R. MacGill, M.C., M.B.; George W. M. Smith, M.D.; John B. Mason; Paul H. S. Smith, M.B.

Dated September 30, 1920.—John J. McConnell.

Dated October 1, 1920.—Reginald T. Raine, M.C.

Dated October 3, 1920.—John C. Davis, M.B.

Dated October 4, 1920—George V. Allen, M.B.; George G. Ferguson, M.B.; James H. Moore, M.B.

Dated October 7, 1920.—Walter N. Leak; Charles I. Hannigan, M.B.; Charles F. Strange.

Dated October 9, 1920.—Frank W. Harlow, M.B.

Dated October 15, 1920.—Arthur S. Webley.

Dated October 16, 1920.—Thomas F. Griffin; James T. Reardon.

Dated October 19, 1920.—Thomas Marlin, M.D.

Dated October 22, 1920.—Charles E. A. Trow.

Lieut.-Col. Sydney O. Hall retires on retired pay, dated October 16, 1920.

Francis Leonard Vaux, M.D., late Lieutenant-Colonel, Canadian Army Medical Corps, to be Temporary Lieutenant-Colonel, dated October 1, 1920.

Capt. George K. Fulton, M.B., late Royal Army Medical Corps, Special Reserve, to be Lieutenant, and to be Temporary Captain, dated August 9, 1917, but not to reckon for pay or allowances prior to October 1, 1920, with precedence next below J. C. Burns.

Temp. Capt. William Angus, M.D., relinquishes the acting rank of Lieutenant-Colonel, dated January 31, 1919.

Capt. Douglas G. Evans, M.B., late Royal Army Medical Corps, Special Reserve, to be Lieutenant, and to be Temporary Captain, dated March 19, 1918, but not to reckon for pay or allowances prior to October 1, 1920, with precedence next below C. P. Chambers.

Temp. Capt. Robert S. Strachan, M.B., to be Lieutenant, and to be Temporary Captain, dated June 15, 1917, but not to reckon for pay or allowance prior to October 1, 1920, with precedence next below K. Masson.

Lieut. Frederick Dudley Ross-Keyt, M.B., resigns his commission, dated October 22, 1920.

Major Theodore F. Ritchie, D.S.O., M.B., retires on retired pay, dated August 18, 1920, and is granted the rank of Lieutenant-Colonel. (Substituted for the notification in the *Gazette* of August 17, 1920.)

Major Victor C. Honeybourne retires, receiving a gratuity, dated October 12, 1920.

Temp. Capt. George A. Mayor, M.B., relinquishes his commission on account of ill-health contracted on active service, dated October 12, 1920, and retains the rank of Captain.

Temp. Major Frank A. A. Holmden relinquishes his commission, dated September 18, 1920, and retains the rank of Major.

Temp. Major J. Turton, T.D., F.R.C.S. (Colonel, Territorial Force Reserve, Army Medical Service) relinquishes his temporary commission, dated September 11, 1920.

The notification in the *Gazette* of December 4, 1919, regarding Temp. Capt. Edwin G. A. Smith is cancelled.

The notification in the *Gazette* of December 6, 1919, regarding Temp. Capt. Henry T. O'Neill. M.B., is cancelled

The date on which Temp. Capt. Clement I. Stockley, M.B., relinquished his commission is September 16, 1920, and not as in the *Gazette* of October 5, 1920.

Lieut.-Col. Frederick W. Hardy, M.B., retires on retired pay on account of ill-health contracted on active service, dated March 27, 1919. (Substituted for the notifications in the *Gazettes* of March 26 and 31, 1919.)

The date on which Temp. Lieut.-Col. Alfred Lingard, M.B., relinquished his commission is September 17, 1920, and not as in the *Gazette* of August 5, 1920.

Lieut.-Col. Charles T. Samman is placed on retired pay, dated October 30, 1920.

Capt. Thomas E. Osmond retires, receiving a gratuity, dated November 9, 1920.

Temp. Capt. Guy Algernon Pratt is dismissed the Service by sentence of a General Court Martial, dated August 19, 1920.

Percy St. John Wilkinson, F.R.C.S., late Major, South African Medical Corps, to be Temporary Major, dated October 21, 1920.

Capt. D'Arcy Power, M.C., relinquishes his Army commission on appointment to a permanent commission in the Royal Air Force, dated July 13, 1920.

Capt. Charles A. Bignold, M.B., resigns his commission, dated August 26, 1920, and is granted the rank of Major. (Substituted for the notification in the *Gazette* of August 25, 1920.)

Temp. Hon. Lieut.-Col. Peter Macdiarmid, O.B.E., M.D., relinquishes his commission, dated September 16, 1920, and retains the hon. rank of Lieutenant-Colonel.

Capt. Patrick J. Corcoran, M.B., resigns his commission, dated November 9, 1920, and is granted the rank of Captain.

Major Robert G. Gayer-Anderson retires, receiving a gratuity, dated November 13, 1920.

The initials of Temp. Capt. James I. P. Wilson, M.D., F.R.C.S., are as now described, and not as in the *Gazette* of October 27, 1920.

Capt. James Harold Sharpe, M.B., resigns his commission, dated October 28, 1920.

Temp. Lieut. George R. Waller, M.B., relinquishes his commission, dated August 31, 1920, and retains the rank of Lieutenant.

Temp. Major William H. G. Aspland, M.D., F.R.C.S., relinquishes his commission, dated September 22, 1920, and is granted the rank of Lieutenant-Colonel.

PROMOTIONS.

The following promotions and appointments, within establishment, will take effect from the dates specified :—

To be Corporals.

Dated June 1, 1920.—Privates: 7249787 W. L. Squirrell (sanitary orderly), with seniority next below 200001 Cpl. J. W. P. Suter; 7246888 A. C. Kilminster (masseur), with seniority next below 6404 Cpl. H. Key; 7251150 W. Brewer, with seniority next below 7190 Cpl. E. Gilligan; 7250206 F. C. Whiting (nursing orderly), with seniority next below 6338 Cpl. T. F. Giles; 7250377 V. C. McIntyre (nursing orderly), with seniority next below 6519 Cpl. W. Duggan; 7250507 F. Weeks (hospital cook), with seniority next below 2050085 Cpl. M. Brady.

Dated August 1, 1920.—7253781 Pte. J. H. Carter (dental mechanic), (W.O. Letter No. 18/A.M.C./995 (A.M D.1), dated October 4, 1920).

Dated August 21, 1920.—389539 Pte. A. Beckley (W.O. Letter No. 18/A.M.C./998 (A.M.D.1), dated October 23, 1920).

Dated October 1, 1920.—Lance-Corporals: 7245545 W. Manners (nursing orderly); 7250448 H. Tottle; 7250818 F. Corbett; 7250489 F. E. Sellars (clerk); 7250968 H. C. G. Holland (clerk); 7250285 J. R. Lewis; 7251313 F. W. Appleby; 7251205 G. W. W. R. Lea; 7250778 T. Wakelin (laboratory attendant); 7250176 C. H. Hoskins (hospital cook); 7252612 C. O. Hutflett; 7250181 J. F. Dingain (clerk); 7251401 W. Dunlin; 7251372 J. S. Gillard; 7250527 J. P. Purcell; 7250788 C. F. Shatwell; 7250455 R. Morrison (laboratory attendant); 7250279 A. Atkinson; 7248608 A. L. Elmer; 7251572 C. G. Double (laboratory attendant); 7250065 W. Andrews (nursing orderly); 7251585 T. Faulkner (nursing orderly); 7250664 J. C. High (clerk); 7249777 D. Glynn; 7250394 F. J. Haste (nursing orderly); 7251350 W. A. Band; 7250451 J. L. Cummings (nursing orderly).

To be Lance-Corporals.

Dated October 1, 1920.—Privates: 7254033 P. Sullivan (nursing orderly); 7245111 S. P. Plunkett (clerk); 7251052 H. Wilson (hospital cook); 7246506 A. G. Fielder (sanitary orderly); 7245716 J. R. Hudson (trained nurse); 7250570 H. H. Wilks; 7254420 E. J. Garrod (dispenser); 7250885 R. J. W. Durham (masseur); 7249799 C. Jewers; 7253400 G. Coupland (dental mechanic); 7251521 W. Parsons; 7248965 A. A. Harrison; 7249741 C. J. Buck; 7253258 H. Mackenzie; 7249585 S. P. J. Brown (dental mechanic); 7249627 E. L. May; 7249611 J. Hickie (dental mechanic); 7249679 R. Saville (dental mechanic); 7249739 F. E. Welch (dental mechanic).

The above promotions and appointments are subject to the provisions of paragraphs 35 and 247 (*a*) Standing Orders, Royal Army Medical Corps, and promotions or appointments withheld under these paragraphs will be immediately reported to this office.

Supernumerary ranks caused by the above promotions and appointments will be adjusted by reverting ACTING RANKS.

The necessary entries should be made in documents and Part 2 Orders.

PROMOTION CANCELLED.

The appointments to Lance-Corporal of the undermentiond soldiers, notified in Corps Order, dated July 1, 1920, are hereby cancelled :—

200399 Pte. J. E. Barr. | 205895 Pte. A. Glennon.

TRADESMEN.

The following soldiers have been registered and advanced as tradesmen, and are eligible for tradesmen's rate of pay in the classes, and from the dates specified :—

Pharmacist, Group A, Class 2.

Dated August 25, 1920. On examination.—7253827 Pte. J. Pearson.

Hospital Cooks, Group B, Class 2.

Dated August 21, 1920. On examination (provisional).—7250863 Pte. W. H. Start.

Dated August 19, 1920. On examination (provisional).—7247697 Pte. (Acting Cpl.) T. S. J. Harris.

Hospital Cook, Group B, Class 3.

Dated August 19, 1920. On examination (provisional). — 7245055 Pte. (Acting Cpl.) J. Darnell.

Dispensers, Group B, Class 1.

Dated August 25, 1920. On examination (provisional).—7254420 Pte. E. J. Garrod.
Dated August 20, 1920. On examination.—19031 Serjt. J. Leahy.
Dated August 12, 1920. On examination (provisional).—7246301 Serjt. A. Vaughan.
Dated August 20, 1920. On examination.—7245559 Temp. Qmr.-Serjt. R. Tothill.

Dental Mechanics, Group B, Class 1.

Dated August 22, 1920. On examination.—Privates: 7249611 J. Hickie, 7250703 H. Wood, 7249553 H. C. Kilmister, 7253500 F. Pollitt, 7249733 E. O. Barnett, 7253742 R. A. Spreadbury, 7253502 C. J. Brown, 7248948 E. G. Slark, 7253536 G. R. Bellerby, 7249897 W. H. Arman, 7248940 V. F. C. Richardson.

Dental Mechanics, Group B, Class 2.

Dated August 22, 1920. On examination.—7248976 Pte. R. Catchpole.

Dental Mechanics, Group B, Class 3.

Dated August 9, 1920. On enlistment.—15794 Pte. H. V. Benson.
Dated August 12, 1920. On enlistment.—7253841 Pte. M. A. B. Cload.
Dated September 4, 1920. On enlistment.—7254436 Pte. H. Hobster.
Dated August 16, 1920. On enlistment.—15806 Pte. A. J. Jackman.
Dated September 16, 1920. On examination.—5210 Pte. S. Burke.
Dated September 9, 1920. On enlistment.—7254448 Pte. J. Bolton.
Dated September 6, 1920. On enlistment.—7254467 Pte. J. Kenefink.

X-ray Attendant, Group B, Class 1.

Dated September 4, 1920. On examination (provisional).—7249625 Pte. G. H. Dudley.

X-ray Attendant, Group B, Class 2.

Dated September 4, 1920. On examination (provisional).—7249595 Pte. W. A. Kirby.

X-ray Attendants, Group B, Class 3.

Dated September 4, 1920. On examination (provisional).—Privates: 7249403 J. R. Sigsworth, 7249578 W. E. Baker.

Nursing Orderlies, Group C, Class C.

Dated August 22, 1920. On examination (provisional).—7253027 Pte. L. Martin. 15693 Lance-Cpl. W. Andrews. Privates: 7248901 C. H. Twinn, 7248889 F. W. Pomphret.

Dated August 21, 1920. On examination (provisional).—Privates: 7251577 A. Hennessey, 7250308 J. Harris, 7249349 E. Martinson.

Dated August 19, 1920. On examination.—7250618 Pte. A. J. Fraser. 205050 Lance-Cpl. T. Faulkner. On examination (provisional)—6816 Pte. W. Johnstone. On examination—7251450 Lance-Cpl. W. Ashworth. 7250419 Cpl. H. J. Clemas. 7250394 Lance-Cpl. F. J. Haste. Serjeants: 7245476 (Temp.Staff-Serjt.) F. J. Mills, 7245872 W. Fletcher.

Dated September 4, 1920. On examination (provisional).—Privates: 7251031 W. Johnson, 7250311 H. Howarth.

Dated August 19, 1920. On examination.—7250581 Lance-Cpl. P. Cheetham. On examination (provisional)—7254289 Pte. J. McGlynn.

Clerks, Group C, Class 3.

Dated August 19, 1920. On examination.—7245705 Serjt. (Temp. Staff-Serjt.) W. G. Curnoe. On examination (provisional)—7254022 Lance-Cpl. A. F. Ashdown.

Sanitary Orderlies, Group C, Class 3.

Dated July 9, 1920. On examination.—Lance-Corporals: 206507 W. Seers, 7248695 W. A. R. Canty. 7254423 Pte. E. L. Ward. On examination (provisional)—7249773 Pte. F. J. Denmark. 7250927 Cpl. A. Biggs. Privates: 7250725 A. Williams, 7248784 C. Moore, 7253612 L. Cadwallader, 7249052 L. Parnell, 7253149 E. W. Legg, 7253575 J. Pendlebury, 7249592 E. R. Northam, 7249576 A. E. Walker, 7249647 F. W. Smith, 7249656 W. Boulter, 7249909 J. Rourke. On examination—7249772 Pte. W. Jolly. On examination (provisional)—Privates: 7249731 H. P. Brown, 7249749 L. Lancaster, 7248728 A. V. Butler, 7252596 W. Linton.

Dated July 11, 1920. On examination (provisional).—7253604 Pte. T. Quinn.

The necessary entries should be made in documents and Part 2 Orders.

REPOSTING TO CORPS.

The undermentioned N.C.O. rejoined the corps from the date specified:—

Dated August 7, 1920.—12588 Staff-Serjt. J. Meason.

EXAMINATIONS FOR PROMOTION.

The following Warrant Officers, Non-commissioned Officers and Men have passed the examinations for promotion:—

AUGUST, 1920.

Passed for Quartermaster-Serjeant.

Dispensers.—Staff-Serjeants: 7245237 W. A. Beckett, 7245662 H. W. Reeves, 7245550 H. A. Baigent, 7245423 A. Newman, 7245366 B. Cockburn, 7245627 W. A. Gordon, 7245531 C. V.

Jefford. Quartermaster-Serjeants: 7248796 W. F. Avery, 7245424 (Temp. Serjt.-Major) S. Shaw. Staff-Serjeants: 7245638 R. Beddy, 7245103 J. R. Cowling, 7245709 A. E. Pegg, 7245240 N. Moore, 7245738 A. F. Leaney. 7245332 Qmr.-Serjt. (Temp. Serjt.-Major) A. Bell. Staff-Serjeants: 7242690 W. J. Bamford, 7245552 A. Leaky, 7245480 H. Elliott, 7245672 (Temp. Qmr.-Serjt.) W. C. Shelley, 7245446 H. C. Hughes, 7245566 F. E. Hort. 7245052 Qmr.-Serjt. (Temp. Serjt.-Major) W. C. Prince.

Passed for Staff-Serjeant.

7254646 Serjt. (Temp. Staff-Serjt.): R. E. Fairweather (trained nurse); Corporals: 7246236 A. R. Bridson (clerk); 7250367 (Acting Serjt.) P. Finlayson (hospital cook); Serjeants; 7250196 A. McCombie (nursing orderly); 7246188 W. G. Crossman, D.C.M. (trained nurse); 7245951 W. S. Parr (dispenser); 7245967 P. F. Pedlow (dispenser); 7245791 N. Huppler (clerk); 7245718 (Acting Staff-Serjt.) A. H. Ardrey; 7245870 (Acting Staff-Serjt.) A. R. Lewis (clerk); 7246605 (Acting Staff-Serjt.) W. V. Dixon (nursing orderly); 7245853 C. W. Newell (nursing orderly); 7246411 A. E. Lawrence (clerk); 7246291 J. E. Samme (operating room attendant); 7246954 P. Sexton (sanitary orderly); 7246323 W. E. L. Eason (dispenser).

Passed for Serjeant.

7247449 Cpl. G. J. D. Webberley; 7250448 Lance-Cpl. (Acting Serjt.) H. Tottle: Corporals 7246991 (Acting Serjt.) E. E. Spring (nursing orderly); 7250199 (Acting Serjt.) P. W. Steele, 7252417 T. Southern (dispenser); 7245839 (Temp. Serjt.) A. E. G. Marsh; 7250452 T. Giles, D.C.M. (trained nurse); 7246648 A. Mines (nursing orderly); 7245298 A. W. Wright (trained nurse); 7246694 (Acting Serjt.) W. C. Hall (clerk); 7245978 F. Crowther (nursing orderly); 7250473 A. T. Leggett (nursing orderly); 7245954 H. W. Gibson (dispenser); 7246069 G. R. Richards (trained nurse).

Passed for Corporal.

7247309 Cpl. (Acting Serjt.) A. A. Barton (X-ray attendant). 7250664 Lance-Cpl. J. C. High (clerk). Privates: 7249627 E. L. May; 7249585 S. P. Brown (dental mechanic); 7250742 W. F. Brickwood (masseur); 7251150 W. Brewer; 7251069 W. Archer; 7249679 R. Saville (dental mechanic); 7253258 H. McKenzie; 7253400 G. Coupland (dental mechanic); 7249611 J. Hickie (dental mechanic); 7249741 (Acting Cpl.) C. J. Buck. 7248704 Lance-Cpl (Acting Cpl.) S. H. E. Barlow. Privates: 7246888 A. C. Kilminster (nursing orderly); 7249787 W. L. Squirrell (sanitary orderly); 7254420 E. J. Garrod; 7249851 (Acting Cpl.) J. H. Hogbin; 7249739 F. E. Welch (dental mechanic); 7254033 (Acting Serjt.) F. P. Sullivan; 7250623 (Acting Cpl.) J. Dempsey; 7251521 (Acting Cpl.) W. Parsons; 7249777 Lance-Cpl. D. F. Glynn. Corporals: 7253939 J. Axon; 7250816 W. O. Brown; 7248772 J. Gray. Lance Corporals: 7250216 E. W. Plimmer; 7250285 J. R. Lewis. 7250804 Pte. C. Buxey (laboratory attendant). 7248639 Cpl. E. J. Crawley. Privates: 7250570 H. H. Wilks; 7250507 (Acting Cpl.) F. Weekes; 7248965 A. A. Harrison. Lance-Corporals: 7251572 C. G. Double (laboratory attendant); 7254198 F. Lane; 7250394 F. J. Haste (nursing orderly); 205050 T. Faulkner (nursing orderly); 7250968 H. C. G. Holland (clerk); 7250181 J. F. Dingain (clerk); 7250489 (Acting Cpl.) F. E. Sellars (clerk). Privates: 7250206 F. C. Whiting (nursing orderly); 7250377 V. E. McIntyre (nursing orderly); 7248827 C. A. V. Brittain.

The necessary entries should be made in documents and Part 2 Orders.

WARRANTS.

Application should be made to this office for Warrants of any Substantive or Temporary Warrant Officers, Class 1 or 2, who have not yet received them.

It should be observed that Warrants are not issuable for Acting Rank.

In submitting applications of Warrant Officers serving overseas, it should be stated to what home address they desire their Warrants to be sent for safe custody.

AMENDMENTS.

(*a*) (*London Gazette*, No. 31560, dated September 20, 1919.)

Roumanian Medaille Barbatie si Credinta, 3*rd Class.*

49945 Pte. (Acting Lance-Cpl.) William Henry Taylor is now correctly described (*London Gazette*, dated July 1, 1920).

(*b*) Corps Order, dated July 1, 1920:—

For 50477 J. R. Johnston
Read 50477 J. R. Johnson.

ROYAL ARMY MEDICAL COLLEGE.

Lieut.-Col. John W. West, C.M.G., M.B., R.A.M.C., to be a Professor, *vice* Col. E. M. Pilcher, C.B., C.B.E., D.S.O., M.B., F.R.C.S., K.H.S., dated January 1, 1920.

QUEEN ALEXANDRA'S IMPERIAL MILITARY NURSING SERVICE.

Matron Miss Agnes Annie Murphy, R.R.C., having reached the age fixed for compulsory retirement, is placed on retired pay, dated October 28, 1920.

Sister Miss Ethel Mary Denne, R.R.C., to be Matron, *vice* Matron Miss B. I. Jones, C.B.E., R.R.C., seconded, dated September 1, 1920.

Sister Miss Agnes Alexander Wilson, R.R.C., to be Matron, *vice* Matron Miss Agnes Annie Murphy, R.R.C., placed on retired pay, dated October 28, 1920.

Staff Nurse Miss Gertrude Marie Kenny resigns her appointment, dated October 14, 1920.

The undermentioned to be Staff Nurses:—

Dated January 16, 1920.—Miss Mary Alexandra Fullerton.

Dated February 1, 1920.—Miss Barbara Janet Somervail.

Dated February 17, 1920.—Miss Millicent Bruce Peterkin.

Dated February 28, 1920.—Miss Phyllis Marjorie Dart Sowter.

Dated March 1, 1920.—Miss Gladys Gertrude Parry.

OVERSEA FORCES.

SOUTH AFRICA.

South African Medical Corps.

The name of Capt. J. R. White, M.B., is as now described, and not as in the *Gazette* of May 14, 1920.

Capt. W. H. R. Sutton, M.B., to be acting Major from May 1, 1917, to November 12, 1918, and to be acting Lieut.-Col. from November 13, 1918, to February 15, 1919. (Substituted for the notifications in the *Gazette* of July 6, 1920.)

Capt. W. H. R. Sutton, M.B., relinquishes his temporary commission on ceasing to be employed, dated February 26, 1919, and is granted the rank of Major. (Substituted for the notification in the *Gazette* of July 1, 1920.)

The undermentioned relinquish their temporary commissions on ceasing to be employed with the Union Imperial Service Contingents, and are granted the rank of Major:—

Dated November 14, 1918.—Capt. W. D. Miller, O.B.E., M.D.

Dated February 26, 1919.—Capt. J. Evans, M.D. (Substituted for the notification in the *Gazette* of May 25, 1920.)

Arthur Hastings Bell to be Temp. Capt. whilst employed as Dental Surgeon with the East African Contingent, dated January 31, 1916.

Temp. Capt. A. H. Bell relinquishes his temporary commission on ceasing to be employed with the Union Imperial Service Contingent, dated September 11, 1916, and retains the rank of Captain.

NOTES FROM ALDERSHOT.—The Command Shooting and Fishing Association held a meeting on September 24. The fishing prospects at Bourley next season are considerably brighter, as it was decided to re-stock all three reservoirs and to limit the number of rods still further.

Shooting commenced on October 1.

The following account of the Royal Army Medical Corps Athletic Meeting is forwarded by the courtesy of the Editor, *Aldershot News*:—

ANNUAL ATHLETIC SPORTS.

"The Royal Army Medical Corps Recreation Ground, Queen's Avenue, presented a gay appearance when the annual athletic sports meeting was held. There was a large attendance of spectators, and they thoroughly enjoyed the long and carefully arranged programme of events. Among those present were General Lord Rawlinson, Major-General Sir R. H. K. Butler, and Major-General S. Guise-Moores, D.D.M.S., Aldershot Command.

"The afternoon opened with fine weather, but half-way through a thunderstorm which had been threatening for some minutes broke, and there was a rush for the marquees. A physical training display by the buglers and boys of the Royal Army Medical Corps Depot, under Serjt.-Major March, R.A.M.C., was carried through in pouring rain, and the Officers' race had to be run in mackintoshes. After a while the rain cleared off, and it was decided to let the boys give another display, which went off faultlessly, and was greatly enjoyed. The boys had been perfectly trained by Serjt.-Major March and deserve every credit for their display.

"Serjt.-Major Prince had a great day, and carried off the Corps challenge cup for the competitor gaining the greatest number of points in the Corps individual events. Prince scored 15 points and Staff Serjt. Mack, who was prominent in the field events, was runner-up with four points less. Prince was also the great factor in the carrying off of the challenge cup by A Company. This cup was awarded to the depot company scoring most points at the meeting, and Prince's company were easy winners with 30 points, B Company being second with 6 points. Prince won the 100 yards in 11 secs., the half in 2 min. 16 1-5 secs., the quarter in 56 3-5 secs., and the mile in 5 min. 19 4-5 secs. He was also easily best in the long jump, clearing 19 ft. 10 in., was second in the 220 yards, and helped his team to win the relay race. Staff-Serjt. Mack won the hurdles in 19 secs.; putting the shot, with a fine put of 35 ft. 9 in.; high jump, in which he cleared 5 ft., and was second in the sprint.

"There were twelve entries for the open Army mile, which was won by the Army cross-country champion, Bat.-Qmr.-Serjt. Old, in 4 min. 39 4-5 secs. He was never in danger and won by 35 yards from Coy.-Serjt.-Major Evans, H.L.I. The third place also fell to an Aldershot Command runner, Serjt. Perry, 1st South Wales Borderers.

"There were, of course, a number of humorous events, such as threading the needle, a mop fight, and a boot melée, and these, in addition to a number of clowns, kept the spectators highly amused.

"A delightful programme of music was rendered by the Corps Band, under Bandmaster F. Bradley. The numerous trophies and prizes were presented by Mrs. Guise-Moores.

"The following were the officials:—Executive Committee: Lieut.-Col. W. Benson, D.S.O., Major T. S. Blackwell, Major W. J. Weston, D.S.O., Capt. R. F. Walter, M.C., Capt. H. A. Ward, Serjt.-Majors J. Sparks, E. Dixon, J. D. Keeble, J. Fakes, E. Sharp and G. P. Steer. M.B.E.; Qmr.-Serjts. H. Marman and L. Brindle, Staff-Serjt. M. P. Miller, and Pte. Lee. Stewards and judges: Major-Gen. S. Guise-Moores, C.B., C.M.G., Col. C. R. Evans, D.S.O., Col. L. M. Purser, D.S.O., Col. J. Hartigan, C.M.G., D.S.O., Lieut.-Col. P. Davidson, C.M.G., D.S.O., Major G. E. Cathcart, O.B.E., Major H. Wells, D.S.O., Major C. M. Rigby, Serjt.-Major J. Sage, W. Andrews, and A. Gray. Referee: Mr. C. Otway, S.C.C.C.A. Starters: Major A. Crook, M.V.O., and Lieut. R. Trenam, M.B.E., M.C., North. Fus. Timekeeper: Capt. S. F. Keyworth, R.H.G. Clerk of the course: Serjt.-Major S. Gallie, M.B.E. Joint Hon. Secs.: Major F. R. Laing and Capt. E. B. Allnutt, M.C. Assistant Hon. Secs.: Qmr.-Serjt. F. Poole and Serjt. L. Richardson.

"220 Yards (buglers and boys, under 18 years).—Harvey, 1; Smith, 2; Catley, 3. Won by 1 yd. and 2 yds.; time, 26 4-5 secs.

"High Jump.—Staff-Serjt. Mack, No. 1 Company, 5 ft., 1; Cpl. Osborne, No. 1 Company, 4 ft. 11 in., 2; Pte. Crump, A Company, 4 ft. 10 in., 3.

"100 Yards.—Serjt.-Major H. M. Prince, A Company, 1; Serjt. Mack, No. 1 Company, 2; Cpl. Mills, B Company, 3. Won by 2 ft. and same; time, 11 secs.

"120 Yards Hurdles (for the Elmsdale challenge cup).—Staff-Serjt. Mack, No. 1 Company, 1; Cpl. Osborne, No, 1 Company, 2; Cpl. Mills, B Company, 3. Won by 10 yds. and 1 yd.; time, 19 secs.

"880 Yards.—Serjt.-Major Prince, A Company, 1; Pte. Crump, A Company, 2; Cpl. Mines, No. 1 Company, 3. Won by 2 yds. and 7 yds.; time, 2 min. 16 1-5 secs.

"120 Yards Veterans' Handicap (12 years' service and over).—Pte. Stilling, 17 yds., 1; Pte. Knox, 6 yds., 2; Pte. Wadey, 3 yds., 3. Won by 7 yds. and 2 ft.; time, 13 4-5 secs.

"220 Yards.—Serjt. Cake, E Company, 1; Serjt.-Major Prince, A Company, 2; Cpl. Osborne, No. 1 Company, 3. Won by 1 ft. and 6 yds.; time, 24 3-5 secs.

"Tug-of-War (catch-weights, for Cambridge Hospital Challenge Cup, presented by No. 1 Company, R.A.M.C.)—No. 1 Company beat E Company by two pulls to nil. Winning team: Major T. Blackwell, Qmr.-Serjt. Collier, Staff-Serjt. Brunt, Ptes. Hubbard, Donoghue, Horsman, Dobbinson, and Winter, Cpl. Osborne and Serjt. Hazell; coach, Serjt.-Major T. Gregson.

"Officers' 110 Yards.—Capt. Steele, 1; Capt. Starkey, 2; Major Rigby. 3. Won by 2 yds. and 1 ft.

"440 Yards (Challenge cup, presented by Major Gen. G. D. Hunter, C.B., C.M.G., D.S.O.)—Serjt.-Major Prince, A Company, 1: Serjt. Cake, E Company, 2; Pte. Crump, A Company, 3. Won by 2 yds. and 12 yds.; time, 56 3-5 secs.

"Warrant Officers' and Serjeants' 100 Yards.—Serjt.-Major Bailey, 1; Qmr.-Serjt. Hazell, 2: Staff-Serjt. Walkley, 3. Won by 2 yds. and 1 ft.

"One Mile (R.A.M.C., for challenge cup presented by the late Col. W. Johnstone, C.B.)—Serjt.-Major Prince, A Company, 1; Pte. Crump, A Company, 2; Cpl. Mines, No. 1 Company, 3. Won by 2 yds. and 8 yds.; time, 5 min. 19 4-5 secs.

"Long Jump.—Serjt.-Major Prince, A Company, 19 ft. 10 in., 1; Cpl. Mills, B Company, 18 ft. 10½ in., 2; Cpl. Osborne, No. 1 Company, 18 ft. 9½ in., 3.

"Putting the Shot.—Staff Serjt. Mack, No. 1 Company, 35 ft. 9 in., 1; Major T. Blackwell, No. 1 Company, 34 ft. 8¼ in., 2; Serjt. Hazell, No. 1 Company, 31 ft. 6½ in., 3.

"Throwing the Cricket Ball.—Private Humphries, A Company, 91 yds. 1 ft. 8½ in., 1; Cpl. Osborne, No. 1 Company, 91 yds. 1 ft. 7 in., 2; Pte. Poole, A Company, 90 yds. 3 in., 3.

"One Mile (open to the Army).—Bat.-Qmr.-Serjt. Old, R.H.A., 1; Coy.-Serjt.-Major Evans, H.L.I., 2; Serjt. Perry, 1st South Wales Borderers, 3. Won by 35 yds. and 10 yds.; time, 4 min. 39 4-5 secs.

"Relay Race (for challenge cup presented by Surgeon-General G. W. Robinson; also the General Hospital Cup, presented by No. 14 General Hospital, B.E.F., for the first Depot Company team to finish. Distances, three 220 yds. and 440 yds.).—A Company, 1; B Company 2. Won by 10 yds.; time, 2 min. 16 4-5 secs. Winning team; Serjt.-Major H. M. Prince. Ptes. Humphries, Poole, and Crump.

"Sack Race.—Pte. Dennis, 1; Cpl. Osborne, 2: Pte. Morris, 3.

"Wheelbarrow Race.—Cpl. Webberley and Pte. Webberley, 1; Cpl. Mills and Bugler Makepeace, 2; Pte. Poole and Boy Thorpe, 3.

"Mop Fight.—Cpl. Webberley and Pte. Humphries, 1; Ptes. Morris and Clarke, 2,

"Children's Races.—Boys: Chas. Henry, 1; J. Sage, 2. Girls: Millie Henry, 4; Kathleen Cora, 2.

"Thread and Needle Race.—Miss Nuding, 1; Miss Ford, 2; Mrs. Walkley, 3.

"Boot Race.—Pte. Germon, 1; Pte. Williams, 2; Pte. Morris, 3.

Tennis.—The Corps distinguish themselves in the Officer's Club Tournament, Capt. J. L. Ritchie, R.A.M.C., winning the open men's singles and open doubles, very well partnered in the latter by Lieut.-Col. W. Benson, R.A.M.C.

The handicap doubles also fell to these sound players after a thrilling struggle with their juniors, who put up an excellent fight.

"The ladies of the Corps were also prominent. Mrs. O'Keeffe taking the open ladies' singles in excellent style, and the open ladies' doubles with her partner. Mrs. Moss and Mrs. Field (both ladies of the Corps) were second in the latter event.

Capt. and Mrs. Ritchie won the mixed doubles. And Mrs. O'Keeffe again distinguished herself by winning the ladies' singles handicap.

Cricket Club—Season 1920.

The past season has been most successful. The Corps Team played twenty-four matches: Won 18; lost 5; drawn 1.

Matches Won (Friendlies).

6th Brigade R.F.A.
Farnham (2).
R.A.F.
Surrey County Mental Hospital (2).
Royal Engineers.
St. John's School, Leatherhead.
Basingstoke.
Aldershot.
St. Bart's Hospital.
37th Brigade R.F.A. (2).
Tidworth Garrison (2).
Alton.

Command Championship.

Royal Fusiliers (Won).
Schoolmasters (Won).

Matches Lost (Friendlies).

St. Bart's Hospital.
Aldershot.
Basingstoke.
R.A.S.C.

Match Drawn—Thornycroft's.

Command Championship.

5th Brigade Royal Horse Artillery (Lost).

Several matches had to be cancelled during June and July on account of the weather. It was most unfortunate that both our home and away matches against Netley had to be abandoned without a ball being bowled.

We were beaten in the Command Championship by the Royal Horse Artillery in the third round.

The encouraging feature of the season was the increased number of players the Selection Committee had to draw from. Last season it was a matter of great difficulty to get sides out, owing to the small number of players at our disposal.

Staff-Serjt. Mack had a wonderful season, and has been our mainstay in attack and defence with an average of 30·1 for 19 completed innings, and in the bowling averages he is well to the fore with 101 wickets at a cost of 6·8 runs each. He was ably assisted by Serjt.-Major Prince, who was a very consistent run getter.

Capt. Percival proved the most improved player in the side and finished with an average of 20 although it was his first year playing for the Corps Team.

Capt. Ritchie did not join the Command until the season was almost finished but for his two innings he averaged 46.

Serjt.-Major Osborne was only with us for a short time, but he showed that he had lost little of his skill.

Cpl. Osborne, our fast bowler, was severely handicapped with soft wickets, and his 41 wickets at a cost of 8·36 runs each can be regarded as a very good performance.

Bowling Averages—Season 1920.

Name	Overs	Maidens	Runs	Wickets	Averages
Staff-Serjt. Mack	248·5	50	695	101	6·8
Capt. Walker	45·0	14	91	13	7·0
Serjt.-Major Prince	54·0	8	154	21	7·33
Cpl. Osborne	135·5	33	343	41	8·36
Pte. Humphries	85·4	16	215	19	11·3
The following also bowled:—					
Qmr.-Serjt. Mayman	18·0	0	77	5	15·4
Qmr.-Serjt. Harris	5·0	3	11	4	2·75
Pte. Rigby	11·0	5	18	4	4·5
Serjt.-Major Osborne	23·0	1	79	3	26·3

Batting Averages—Season 1920.

Name		Innings		Not out		Most in an innings		Total runs		Averages
Staff-Serjt. Mack	.. ..	21	..	2	..	89	..	572	..	30·1
Serjt.-Major Prince	.. ..	15	..	1	..	86	..	341	..	24·3
Capt. Prosser ..	.. ..	8	..	0	..	72	..	173	..	21·62
Capt. Percival	.. ..	21	..	1	..	50	..	401	..	20·0
Qmr.-Serjt. Quelch	.. ..	20	..	1	..	66*	..	355	..	18·6
Cpl. Osborne ..	.. ..	14	..	2	..	46	..	212	..	17·6
Serjt.-Major Jack	.. ..	12	..	2	..	38	..	159	..	15·9
Serjt.-Major Keeble	.. ..	17	..	2	..	74	..	222	..	14·8
Capt. Walker ..	.. ..	13	..	0	..	22	..	123	..	9·46
Capt. Davis ..	.. ..	11	..	2	..	19*	..	70	..	7·77
Pte. Humphries	.. ..	15	..	0	..	30	..	94	..	6·26
Staff-Serjt. Miller	.. ..	12	..	0	..	15	..	70	..	5·83
Serjt. Harding	.. ..	7	..	1	..	15*	..	35	..	5·8
The following also batted—										
Capt. Ritchie ..	.. ..	2	..	0	..	77	..	92	..	46·0
Serjt.-Major Osborne	..	4	..	0	..	56	..	73	..	18·25
Serjt. Sims ..	.. ..	3	..	0	..	18	..	34	..	11·3
Lance-Cpl. Gillard	.. ..	5	..	1	..	22*	..	32	..	8·0
Qmr.-Serjt. Mayman	..	3	..	0	..	9	..	17	..	5·66

* Denotes not out.

NOTES FROM NO. 6 COMPANY, ROYAL ARMY MEDICAL CORPS, COSHAM.—During the spring of this year the prospects of having any cricket during the 1920 season were not at all rosy. The recreation ground at the Alexandra Hospital, Cosham, was used during the war to accommodate part of the hospital in marquees, with the result that it was ruined for recreational purposes, being intersected with cinder paths and shallow trenches.

A grant of about £60 was obtained from the Area Sports Committee, and after a great deal of work the ground was improved by March to such an extent as rendered the prospects of cricket distinctly more hopeful. A pitch was returfed, cinder paths removed, trenches filled in, parts of the ground resown, etc., and by the time the cricket season opened quite a respectable ground had been obtained.

Cricket.—The Company suffered from the usual complaint in these hard days—shortage of personnel, but in spite of this an eleven was raised and we have had a very successful season under the circumstances.

Fortunately the services of three most enthusiastic cricketers were available during whole or part of the season, viz., Lieut.-Col. C. H. Turner, D.S.O., Major A. H. Jacob and Capt. and Qmr. H. Steele.

Thirty fixtures were arranged, and of these :—

14 were won,	1 was drawn,
10 were lost,	1 was abandoned (rain),
4 were cancelled.	

Unfortunately both matches against the Royal Victoria Hospital, Netley, were lost, but the enjoyment of the trip to Netley and of the Netley team's visit to us more than made up for those disappointments.

In addition to the thirty "official" fixtures several matches were arranged between teams composed of "ladies" *versus* "gents" and between "mixed" teams. They provided great entertainment to players *and* to spectators.

Six of the regular players for the Company reached double figures in the batting averages, viz. :—

		Average
Capt. and Qmr. H. Steele	.. .. ..	16·60
Lieut.-Col. C. H. Turner. D.S.O.	.. ..	15·66
Major A. H. Jacob ..	.. .. ..	15·09
Staff-Serjt. T. Walkley	.. .. ..	14·00
Major W. L. Howell ..	.. .. ..	12·10
Lieut.-Col. W. C. Croly. D.S.O.	.. ..	12·10

The three best bowling averages were as follows :—

Major A. H. Jacob ..	.. .. ..	6·72
Lieut.-Col. C. H. Turner, D.S.O.	.. ..	8·70
Capt. and Qmr. H. Steele	.. .. ..	8·80

Football.—Towards the end of the cricket season the prospect of raising a football team was discussed and several "test" matches were arranged to find material.

No. 6. Company, Royal Army Medical Corps Football Club was formed with Col. C. K. Morgan, C.B., C.M.G., A.D.M.S., Southern Area, as President, and Lieut.-Col. W. C. Croly. D.S.O., Officer Commanding No. 6 Company, Royal Army Medical Corps, as Vice-President. A team was found and was entered in Division II of the United Services League. The team had

excellent prospects but unfortunately was wrecked by the detailing of five of its "mainstays" for drafts abroad, etc. As a result the team had to be withdrawn from the League. However, football is anything but dead and "friendly matches" are being arranged.

Billiards.—The billiard-table in the Company recreation room has recently been repaired and a billiard team from the Serjeants' Mess has been entered in the Serjeants' Billiard Tournament for the Baggs Shield. Serjt.-Major Winkley, Chief Clerk to the Assistant Director of Medical Services, Southern Area, is the mainstay of the team, and his performance against a team from the Royal Garrison Artillery, Clarence Barracks, elicited an enthusiastic paragraph in the local press. The game was 150 up. Towards the end of the game Serjt.-Major Winkley's opponent made a break of 47 bringing him within 4 points of the 150 required and leaving Serjt.-Major Winkley at slightly over 100 points. Serjt.-Major Winkley, however, visited the table for the last time and left it the winner having run out with a break of 43 and winning by 4 points.

Serjeants' Mess Outing.– On July 15 the Annual "Outing" of the Serjeants' Mess took place. A party of twenty-eight composed of members of the Serjeants' Mess and their friends proceeded by char-a-banc to Brighton. A most enjoyable day was spent, the party returning tired but happy.

Royal Army Medical Corps Sports, Aldershot.—The Company turned out for the sports in strength. A party from the Serjeants' Mess proceeded by char-a-banc. Several events had been entered for and the Company carried off the following prizes:—

Officers' Race: 1st prize, Capt. and Qmr. H. Steele.
Warrant Officers', Staff Serjts.' and Serjts.' Race: 1st prize, Acting Serjt.-Major J. Bailey.
Ladies' Race: 3rd prize, Mrs. Walkley.
Consolation Race: 1st prize, Temp. Serjt.-Major C. E. Bull, D.C.M.

NOTES FROM BURMA.—Although Burma is referred to as the "backwater" of India it is a very delightful one, the people and the scenery are most fascinating, but the climate is distinctly trying. The Headquarters of the Division (it is shortly to be made an independent district) are at Maymyo, which is 3,400 feet above sea level. Here flowers and fruit flourish all the year round and, except during April and May when it is rather hot, and September and October which are both very wet months, it is a most charming station. Good shooting and fishing are to be had in the vicinity, there is an excellent golf course, polo ground, tennis courts, open air swimming bath, etc., and beautiful rides through the surrounding forests where game of all sorts abound.

At present one British and one Indian regiment are stationed at Maymyo, it is also the hot weather station of the Government.

There are two "seasons," one during April and May, and the other during September and October, when the Government move up from Rangoon.

Royal Army Medical Officers at Maymyo are: Brevet Col. A. H. Safford, A.D.M.S., Burma Division; Major D. Gordon Cheyne, M.C., D.A.D.M.S., (Sanitary); Lieut.-Col. C. A. Stone, in command of the British Station Hospital; Major E. W. Paine and Capt. G. R. Hubbard.

The British Station Hospital is a modern building and one of the most up-to-date out East.

The other stations where British troops are stationed are: Mandalay, Major G. H. Stack in command of the British Station Hospital; Meiktila, where there has been a large camp for Turkish Prisoners of War, with Lieut.-Col. H. R. Bateman, D.S.O., as Senior Medical Officer. During the year a large number of Royal Army Medical Corps officers have been detailed for duty at Meiktila owing to a severe epidemic of dysentery amongst the prisoners, but now only Capt. Galbraith Gill, D.S.O., O.B.E., M.C., Capt. McLeod and Capt. Fulton remain, in addition to Lieut.-Col. Bateman. Mandalay and Meiktila are in the dry zone and the climate is very hot.

At Rangoon Major R. E. F. Austin is in command of the Station Hospital with Capt. R. P. Cormac and Capt. D. G. Evans doing duty; the two latter have lately been appointed to Lectureships at the Rangoon Medical College. The climate in Rangoon is hot and moist most of the year and is by far the most unpleasant in Burma. There are several clubs, including a Boat Club, which supplies all sorts of boats except sailing, for boating on the lakes. The best golf course is about twelve miles away, as a rule reached by motor. To enjoy life in Rangoon a motor or motor cycle is essential.

Port Blair, the penal settlement in the Andaman Islands is included in the Burma Division: Capt. H. J. Hyatt is commanding both the British and Indian Station Hospitals. Except for the climate, which is very damp and hot, this is a most interesting and delightful station, with beautiful scenery and excellent fishing and yachting.

Indian troops are at Bhamo and Shwebo; the former is extremely interesting as it is on the frontier, and all the caravans from China arrive there. It is on the Irrawaddy river and reached by steamer from Katha or Mandalay,

The drawbacks to Burma are its climate and lack of communications. There are very few roads, so that very little motoring can be done; the railway is a metre gauge, very slow and far from comfortable.

The Irrawaddy Flotilla Company provides excellent accommodation on their mail steamers and delightful trips can be taken anywhere between Rangoon and Bhamo, the distance between these places being over a thousand miles by river.

Good big game shooting can be had when one knows the ropes, but this knowledge takes some little time to acquire.

The language is difficult and very few Royal Army Medical Corps officers trouble to master it as they seldom remain long enough in the country for it to be of any practical use.

Clothing and kit in general is the same as for India.

NOTES FROM GIBRALTAR.—Those members of the Corps who served in Gibraltar in pre-war days will be interested to learn that the Royal Army Medical Corps Quadrille Club Dances, which used to be one of the outstanding features in the social life of the "Rock," have been revived and promise to be as popular as ever, judging by the attendance at the first two dances of the season. The Committee are to be heartily congratulated on their success, and we are particularly fortunate in securing the services of Cpl. W. Boister, R.A.M.C., an old member of the Company, to whose experience and keenness the successful launching of the Club is in a large measure due. The following are the members of the Committee:—

President: Staff-Serjt. J. Howitt, R.A.M.C.
Hon. Sec. and Treasurer: Serjt. W. Taylor, R.A.M.C.
M.C.s: Cpl. W. Boister, R.A.M.C., Lance-Cpl. J. Lewis, R.A.M.C., Pte. C. Walsh, R.A.M.C.

Cricket.—The cricket team have had a fairly successful season, the total wins nearly balancing the losses, which, considering the strength of the other units with whom they have had to play, is quite creditable. Serjt. Huppler was the most conspicuous performer, especially with the bat, easily passing the 1,000 runs, and with a little more success with the ball would have completed the double. It is regretted that the Officers' leave period clashes with the cricket season, as the team have had their Captain, Major S. M. Meadows, away while the Nicholson Cup matches were being played, and considering his position in the averages, both batting and bowling, his presence might have meant the difference of winning instead of losing. Col. H. S. Thurston, A.M.S., is also well up in both averages, but unfortunately the team lost his services during the period of his leave, which occurred about the same time as that of Major Meadows.

The best averages are appended:—

Batting.

Name	Number of innings	Total score	Times not out	Highest score	Average
(1) Serjt. Huppler	33	1,310	3	102*	43·66
(2) Major S. M. Meadows	20	396	1	76	20·84
(3) Serjt. Taylor	38	672	1	70*	18·16
(4) Serjt. Warnes	33	513	2	64	15·55
(5) Col. H. S. Thurston	12	146	1	35	13·27
(6) Cpl. Mulley	34	367	5	40*	12·66
(7) Cpl. Sandys	13	112	2	23	10·18

* Signifies not out.

Bowling.

Name	Runs	Wickets	Overs	Maidens	Average
(1) Major S. M. Meadows	317	36	97	7	8·81
(2) Cpl. Sandys	361	38	98	22	9·50
(3) Col. H. S. Thurston	116	9	28	1	12·88
(4) Serjt. Huppler	1,159	89	330	35	13·02
(5) Pte. Fowler	386	29	100	9	13·31
(6) Major G. S. Parkinson	234	15	56	2	15·60
(7) Pte. Tait	836	53	235	27	15·77

The team played 37 matches, winning 15, drawing 5 and losing 17.

NOTES FROM MALTA.—There have been many changes since the Armistice. All the hospitals that were established to cope with casualties from the Dardanelles, &c., have been closed.

The last year has been fairly strenuous, most of the older soldiers have left and their places were taken by recruits, whose time is now fully occupied by routine work, technical and educational training.

Old Malta friends will be interested to hear that Valletta Hospital has at last been closed; also the R.M.A. Hospital, which was in the same building. The R.M.A., and local troops are now received in the main military hospital.

On June 23, the long talked of move of the hospital from Cottonera, to the new site at Imtarfa was began. This building was commenced in January, 1915, when the foundation stone was laid by Sir Leslie Rundle, then Governor and Commander-in-Chief. It had been left in a partly finished state, but a couple of months work made it capable of being used as a hospital, and we moved in. It is situated on almost the highest point of the island; one gets any wind there may be, and the views are charming. As there are no quarters for Officers and Nursing Sisters, or Institutes for the N.C.Os. and men, we have had to make use of the essential parts of the neighbouring barracks. Our only objection is the distance, we are away from everywhere and

everybody (about eight miles from Valletta). Owing to our partial occupation of the Imtarfa Barracks, no Battalion can come in, so we form a little colony by ourselves.

The Military Families Hospital has also moved and has been installed in the old Detention Hospital at Imtarfa.

It is understood that Cottonera Hospital is to be given over to the Civil Government. Valletta Hospital is now the Headquarters of the Civil Police.

The establishment of the Corps is considerably smaller than in pre-war days, and in consequence it is difficult to raise cricket and football teams, but we hope to do better things now that we are getting settled down, and the permanent staff is arriving.

The Company held a small sports meeting in May, which was much enjoyed.

The Officers tennis six beat all units in the island. Unfortunately we did not carry off any prizes in the open tournament, but Capts. J. H. Pendered and G. F. Carr, made a very good effort.

The Corps has two strong representatives at golf—Capt. W. Fotheringham and Capt. G. F. Carr; the course is not one that gives full scope to the former's play, being too short.

The trooping season is upon us, and we are losing several of the oldest residents amongst the personnel. We wish them the best of luck on being re-posted.

NOTES FROM SECUNDERABAD, DECCAN, INDIA.—The Detachment Royal Army Medical Corps, ex s.s. "Huntsend," and via Deolali, and posted to this delightful station on July 10, 1920, are now settling down.

Secunderabad is one of the few stations selected for the posting of Royal Army Medical Corps personnel. There is a most up-to-date hospital, with electric light and fans.

The Detachment Royal Army Medical Corps is very fortunate. The men are housed in a large, airy bungalow, having electric fans, electric light, etc.

The messing is in the hands of a Committee, and the catering is excellent, all attached regimental details being very loth to depart to their regimental duties, when their reliefs are posted from time to time.

All Regiments and Corps in the garrison have extended every assistance in the sports line, tennis, boxing, football, dances, whist drives, etc.

A Sports Club has been organized, with Colonel Jack Powell, D.S.O., R.A.M.C., Officer Commanding British Station Hospital, as President, and a representative committee of other ranks. Corps jerseys, and other necessary gear, have been obtained, and several keen matches have been fought out on the various football grounds in the station. The results up-to-date are as follows: Games played: 17, won 9, drawn 2 and lost 6; points 20; goals: for 29, against 21.

Cricket under Captain P. D. Warburton, R.A.M.C., is now arranged, and it is hoped to send further reports on this pastime later.

The Royal Army Medical Corps Officers' Entertainment Fund, which had lapsed during the war, has now been revived

Colonel Jack Powell, D.S.O., and the Officers, Royal Army Medical Corps, were "At Home" to the Station at the Bolarum Golf Club. Miniature Silver Cups were presented for the best scores. Ladies, won by Mrs. Symonds, 7th Hariana Lancers; men, won by Mr. MacKenzie, Assistant Resident. Miniature Putting Course Competition: Ladies, Mrs. Stobart, 18th (Q.M.O.), Royal Hussars; men, Mr. O'Dawd, H.E. the Nizam's Government. During the afternoon the Band of the 79th Carnatic Infantry played. Tea, with unlimited drinks, was served in large tents, and as the darkness fell, numerous lamps lit up the scene, and a few rag times were danced on the Club lawn, bringing a most enjoyable "At Home" to an end

Colonel Jack Powell, D.S.O., and Captain A. W. P. Todd, M.C., won the Inter-Unit Billiard Cup. There were fourteen entries, and the Royal Army Medical Corps emerged victors, beating the 99th Battery, Royal Field Artillery, 18th (Q.M.O.) Royal Hussars, Military Works Department, and in the final, "J" Battery, Royal Horse Artillery.

Colonel Jack Powell, D.S.O., and Captain P. D. Warburton, were beaten in the semi-finals of the Club Tennis Tournament by the ultimate winners, after putting up a stern fight, which at one time, looked like a victory for the Royal Army Medical Corps.

The Officers of the Indian Medical Service and Royal Army Medical Corps combined to enter a team for the Inter-Unit Golf Cup, but owing to a series of misfortunes in the shape of illness and moves, the team eventually playing was rather weak and was knocked out in the first round.

During the past three months we have lost on change of station: Major Arthur, who was one of the best snipe shots in the station; Captain Popham, our International Hockey Expert; and Captain Creagh, who is a first class horseman and represented the Corps at all the Race Meets.

"NORTHERN NUMBERS."

A FORMER Non-commissioned Officer of the Corps, Mr. C. M. Grieve, is the Editor of a collection of contemporary Scottish poetry, "Northern Numbers" (Foulis, 6s.), to which he contributes a section of poems. His associates in this experiment in group-publication include Col. John Buchan, Neil Munro and Joseph Lee (author of "Ballads of Battle"). Ex-Serjt. Grieve (No. 64020) served with the 42nd General Hospital in Salonika and was invalided with malaria. He acted as caterer of the Depot Serjeants' Mess at Blackpool in August, 1918, and subsequently served as a sub-assistant surgeon with the Sections Lahore 1, G. Hospital at Marseilles. He was demobilized in July, 1919.

RETIRED PAY APPOINTMENTS.

Vacant.

Command		Station	Command		Station
Scottish	.. ..	Aberdeen.	Southern	.. ..	Christchurch.
,,	.. ..	Ayr.	,,	.. ..	Coventry.
,,	.. ..	Inverness.	,,	.. ..	Efford Fort.
,,	.. ..	Berwick.	,,	.. ..	Horfield.
,,	.. ..	Hamilton.	,,	.. ..	Netheravon.
Northern	.. ..	Beverley.	,,	.. ..	Stamford Fort.
,,	.. ..	Halifax.	,,	.. ..	Trowbridge.
,,	.. ..	Leicester.	,,	.. ..	Weymouth.
,,	.. ..	Lincoln.	,,	.. ..	Worcester.
,,	.. ..	Richmond.			
,,	.. ..	Scarborough.			
Western	.. ..	Carlisle.	Irish	.. ..	Berehaven.
,,	.. ..	Lancaster.	,,	.. .	Birr.
,,	.. ..	Liverpool.	,,	.. ..	Clonmel.
,,	.. ..	Manchester.	,,	.. ..	Longford.
,,	.. ..	Wrexham.	,,	.. ..	Naas.
Eastern	.. ..	Bury St. Edmunds.	,,	.. ..	Omagh.
,,	.. ..	Languard Fort.	,,	.. ..	Waterford.
,,	.. ..	Northampton.			

NOTES REGARDING THE RETIREMENTS, RESIGNATIONS AND MOVEMENTS OF OFFICERS UP TO NOVEMBER 15, 1920.

The following Officers retired on retired pay on the dates specified:—

Lieut.-Cols. F. Harvey, J. H. Campbell. C.B.E., D.S.O., and Major A. W. A. Irwin, O.B.E., on November 12.

Lieut.-Col. C. T. Samman on October 30.

Lieut.-Col. T. McDermott, O.B.E., on November 1.

Lieut.-Col. S. O. Hall, on October 15.

Majors H. W. Long, A. B. Smallman, C.B.E., D.S.O., F. A. Stephens, D.S.O., on November 15.

Major G. Gayer-Anderson and Captains S. J. Higgins, I. R. Hudlestone, D.S.O., S. H. Smith, M.C., all retired on a gratuity on November 15.

Lieut. (Temp. Capt.) W. S. Gross resigned his commission on November 15.

Lieut.-Col. S. G. Butler, D.S.O., is retiring on retired pay at an early date, and Capt. T. E. Osmond will shortly retire on a gratuity.

Captains E. Parker and W. L. A. Harrison are resigning their commissions.

Lieut.-Col. A. D. Waring has returned home sick from the Black Sea and been posted to the Southern Command for duty from November 7.

Major T. S. Dudding, on his arrival from India has been appointed Deputy Assistant Director of Hygiene at Tidworth from October 11.

Lieut.-Col. W. M. B. Sparkes has, on arrival home from India been posted to the Royal Hospital, Kilmainham.

Major J. C. L. Hingston and Captains D. Reynolds and A. G. J. MacIlwaine have arrived home from India, but have not yet been posted to a home command.

Captains F. A. Robinson and G. B. Haddon arrived home from Mesopotamia, Capt. Robinson being posted to the Northern Command from November 7, and Capt. Haddon to the Irish Command from December 23.

Capt. F. P. Freeman has returned from the West African Field Force, but has not yet been posted.

Major E. Gibbon and Capt. B. H. C. Lee-Wilson have been restored to the Royal Army Medical Corps from the Egyptian Army, Major Gibbon going to the Aldershot Command and Capt. Lee-Wilson to the London District for duty.

Col. L. P. More has been restored to establishment from the half-pay list and posted to the Irish Command as Assistant Director of Medical Services, 1st Division, from October 10.

Major (Brevet Lieut.-Col.) A. R. Wright, D.S.O., proceeded to India on October 25, Capt. J. T. McConkey to Mesopotamia on October 13, and Capt. R. W. Galloway, D.S.O., to Mesopotamia on October 25.

Capt. J. H. Spencer was promoted to the rank of Major on July 25, 1920.

Major W. R. Galwey, O.B.E., M.C., has been transferred from temporary duty in A.M.D. 2, at the War Office, to the Royal Army Medical College.

The following movements of Warrant Officers and Non-commissioned Officers of the Corps took place during October:—

ARRIVALS FROM OVERSEAS DURING MONTH OF OCTOBER.

7245340 Serjt.-Major W. T. Leach, from Jamaica to Depot.
7245636 Cpl. A. V. Berry, from A.T. "Glengorm Castle" to Depot.
7245060 Staff-Serjt. (Temp. Qmr.-Serjt) E. H. Jesson from No. 10 Stationary Hospital, Belgium, to Depot.
7245255 Qmr.-Serjt. P. Kirby, from A.T. "Glengorm Castle" to Depot.
7245571 Staff-Serjt. H. J. Carroll, from A.T. "Glengorm Castle" to Depot.
7245129 Qmr.-Serjt. W. W. Bee, from A.T. "Panama" to Depot.
7245301 Staff-Serjt. W. T. Roden, from A.T. "Panama" to Depot.
7248578 Serjt. F. Poulton, from Headquarters B.T. in F. and F.
7245579 Staff-Serjt. C. V. Chatten, from Mesopotamia.

DEPARTURES OVERSEAS DURING THE MONTH OF OCTOBER.

7247290 Serjt. C. R. Rich, from Depot to Dantzig.
7246469 Cpl. H. Shorey, from Depot to Dantzig.
7245037 Staff-Serjt. F. G. Mayman, from Depot to Dantzig.
7250189 Cpl. E. J. Manchip, from Depot to Dantzig.
7246207 Cpl. F. N. E. S. Hunter, from Depot to Dantzig.
7245615 Staff-Serjt. A. J. Kent, from Depot to Mesopotamia.
7245345 Qmr.-Serjt. F. W. Day, from Dantzig to Mesopotamia.
7245430 Serjt. B. J. Bull, from Depot to Mesopotamia.
7246834 Cpl. T. F. Giles, from Dantzig to Mesopotamia.
7245105 Cpl. G. Dipple, from Depot to Mesopotamia.
207807 Cpl. J. M. Mackenzie, from Depot to British Inter-Allied Commission of Control, Berlin.
7245593 Serjt. D. G. Harding, from Depot to Mesopotamia.
7250927 Cpl. A. Biggs, from Depot to Mesopotamia.
7245266 Cpl. A. A. Dean, from Depot to Mesopotamia.
7245730 Cpl. R. Geary, from Depot to Sierra Leone.
7245692 Serjt. C. Licence, from Depot to Mesopotamia.
7245850 Serjt. E. G. Fraser, from Depot to Mesopotamia.

ROYAL ARMY MEDICAL CORPS FUND.

ROYAL ARMY MEDICAL CORPS FUND OFFICERS' BENEVOLENT SOCIETY.

NOTICE.

The Secretary begs to acknowledge with very many thanks the receipt of Post Office Order for £30 from the Serjeants' Mess of No. 44 General Hospital, Deolali, India, forwarded by Lieut.-Col. S. L. Pallant, D.S.O., Royal Army Medical Corps, the Commanding Officer. The money has been credited to the General Relief Branch of the Royal Army Medical Corps Fund for the benefit of Warrant Officers, N.C.O's., and men of the Corps, and their wives, widows and children.

76, *Claverton Street, S.W.* 1.
November 15, 1920.

E. M. WILSON, *Lieut.-Col.*
Secretary.

ARMY MEDICAL OFFICERS' WIDOWS AND ORPHANS FUND.

SUMMARY OF THE PROCEEDINGS OF A QUARTERLY MEETING OF THE COMMITTEE WHICH WAS HELD AT THE ROYAL ARMY MEDICAL COLLEGE ON OCTOBER 28, 1920.

Present.

Major-Gen. W. S. M. Price, Vice-President, in the chair.
Major-Gen. Sir H. R. Whitehead, K.C.B., Vice-President.
Major-Gen. Sir W. B. Leishman, K.C.M.G., C.B., F.R.S., K.H.P.
Col. Sir R. H. Firth, K.B.E., C.B.
Lieut.-Col. A. C. H. Gray, O.B.E.

(1) The minutes of the previous meeting were read and confirmed.

(2) The death, in his 85th year, on July 27 last, of the President of the Society, Deputy Surg.-Gen. William Gerard Don, was reported, and his widow was placed on the list of annuitants. The Secretary was directed to write to Mrs. Don expressing the sympathy of the Committee with her in the loss of her husband, who for many years had been a warm supporter of this Fund. For the past twenty years Deputy Surg.-Gen. Don has been a Vice-President of the Society, and in that period has missed hardly a meeting of the Committee.

(3) The death was reported of an annuitant—Mrs. N. Hannagan.

(4) The following were admitted married members: Col. J. A. Hartigan, D.S.O., subscription £26 5s. 6d., from October 16; Capt. S. P. Sykes, subscription £14 11s. 6d., from October 1.

(5) In view of the interest on War Stock, approximately £3,100, due on December 1, it was resolved that cash surplus available at that date be, subject to the approval of the Trustees, invested in such securities guaranteed by the British Government as may at that time be considered advisable by the Actuary and the Hon. Treasurer, Sir James McGrigor.

(6) The Secretary reported that notices of the benefits offered by the Society had been sent, in most cases for the second time, to officers, more than 400 in number, who have joined the Corps since 1914.

(7) Payment of the Secretary's salary for the past quarter was sanctioned, also that of office allowance and a printer's bill.

3, *Homefield Road,* J. T. Clapham, *Captain,*
Wimbledon, S. W. *Secretary.*

NOTICE.

This Fund provides annuities of £50 a year during widowhood, to the widows of officers who have held permanent commissions in the Royal Army Medical Corps. In the event of the death of the widow this annuity is continued to the children of such marriage until the youngest attains the age of 21 years. It also continues for their benefit, up to the same age, if the widow re-marries. Furthermore, should the wife of the subscriber predecease him, it will be optional for him to continue the subscription he had been paying as a married member, in order to provide an annuity similar to the above for the children of the marriage, until the youngest shall have attained the age of 21 years.

Provision is also made whereby a part of the surplus at any quinquennial valuation may be applied for the benefit of members, or their widows, or orphan children. Thus, by the appropriations of surplus at the valuations of December 31, 1910 and 1915, the prospective widows of first-class married members on the books at those dates will receive, during this current quinquennium, £200 and £100 respectively at the death of their husbands, their annuities being also increased to the statutory limit of £52.

The next valuation will be made at the end of the year 1920.

Unmarried members pay an annual subscription of £2, and on passing to the married class are allowed the equivalent of all past subscriptions in the unmarried class by way of reduction of their annual subscription in the married class. Should they pass to the married list in time of war, they are not liable for any extra charge which may then be in force for new members.

The principal conditions of membership and benefits derivable therefrom, will be found in Rules I, III, V (as amended by Appendices II and III), VII, IX, X (as amended by Appendix I), XII and XVII.

Examples of the annual subscription for married members which may now be paid in equal half-yearly instalments, are:—

Husband's age	Wife's age	Annual subscription
25	20	£13 8 5
30	27	£14 6 1
36	33	£16 17 2
46	40	£22 12 6
50	45	£24 9 5

Once a member has been admitted, this subscription covers all war and climate risks; but the Committee has the power to decline applications for membership in war time, or to accept them at an extra charge.

At present no extra charge is being made to applicants serving in any part of the world.

At the end of the year 1919 the funds of the Society, after allowing for the present depreciation of Securities, were of a value of £152,500. The income of the Society in that year was £10,019, and its expenditure £4,279.

The members then numbered 171, and the annuitants 68.

The Secretary will be glad to give further information as to details.

3, *Homefield Road,* J. T. Clapham, *Captain.*
Wimbledon, S. W. 19. *Secretary.*

ROYAL ARMY MEDICAL CORPS CENTRAL MESS FUND.

Summary of the Proceedings of the Annual General Meeting of subscribers to this Fund, which was held in the Library of the Royal Army Medical College on June 14, 1920, Lieut.-Gen. Sir T. H. J. C. Goodwin, K.C.B., C.M.G., D.S.O., K.H.P., Director-General, in the chair.

(1) The minutes of the previous Annual General Meeting were taken as read.

(2) The accounts for the year ended February 29, 1920, were examined and unanimously adopted, as was the Report.

(3) As regards the question of the Debentures of the Rawal Pindi Mess, which had been

referred for further consideration at the last General Meeting, the Committee submitted the following proposal:—

"That provided the balance sheet and other statements expected from the Rawal Pindi Mess be satisfactory, the Committee, in addition to making a grant to the Mess of £100 to pay off old Debentures, be empowered to buy, this year, £300 new Debentures, at 4 per cent, without yearly repayment of principal. If this be approved the General Meeting is asked to appoint the necessary trustees, who can also act as trustees for the fund in the case of other investments."

After some discussion the above proposal was put as a resolution by the Chairman and carried *nem. con.*

It was further resolved that the following Officers be appointed Trustees of the Fund:—

Brevet Lieut.-Col. P. Davidson, C.M.G., D.S.O.
Brevet Lieut.-Col. C. G. Browne, C.M.G., D.S.O.
Brevet Lieut.-Col. W. Benson, D.S.O.

(4) At a recent meeting of the Committee, when a request for further support for the London Mess was under discussion, the question was raised whether all such officers stationed in London as are liable subscribe to that Mess in accordance with K.R., para. 1153:—

"Every officer on the strength of a Corps, whether present or absent, will also pay a subscription to defray the ordinary expenses of the Mess, at a rate to be fixed by the Commanding Officer, but not under any circumstances to exceed eight days' pay of his regimental rank yearly. This subscription will be charged from the date of appointment and be payable quarterly in advance. A married officer is liable to only one half of the annual subscription, when he does not regularly attend the Mess as a dining member. The depot mess will be credited with the subscription of officers serving thereat."

The Committee being informed that all such officers do not subscribe, considers that it is not justified in making further grants to the Headquarters Mess until this matter has been brought before the General Meeting, and therefore submits it.

Col. Hinge: The only officers who subscribe to this Mess at present are the officers of the Millbank Area. The officers of the London district do not subscribe. I sent round a circular to the Headquarters of the Eastern Command, the War Office and the Headquarters of the London District, asking that officers should subscribe to this Mess as they are in the Area, but the argument rather is that this is a Millbank Area, and not a London Area, and that they are not, therefore, liable under King's Regulations.

The Chairman: You mean that Millbank does not come into the London District?

Col. Hinge: The Deputy Director of Medical Services, London District, has nothing to do with this Mess really, although it is situated in the London District. I approached the Deputy Director of Medical Services, and he said that the officers were quite willing to subscribe, but that this is a Headquarters Mess, and should be supported by the officers of the Corps. At present it is not so supported; it is supported by the Officers of the Millbank Area alone. It is also supported by grants and loans from the Royal Army Medical Corps Central Mess Fund, but that is not a good way; it should have a regular income.

Major-Gen. G. B. Stanistreet: Has the question ever come up before as to whether Officers of the London District come within this para.? I think they used to do so.

Major Middleton: Up to the outbreak of war all the officers of the London District, including the Officers of the Eastern Command at the Horse Guards, did so.

Major-Gen. Guise Moores said he thought it would not make much difference to the Mess if the Officers of the London District and Eastern Command were included in the subscribers.

Major Middleton: I have got the number, and worked it out approximately—it would give us an income of about £23 a month, and from the War Office we should have about £9—total £32 a month. The Mess requires £145 when there are no classes, and £45 per mensem when one class is in residence.

Major-Gen. Guise Moores said that he thought the difficulty might be solved if every officer in the Corps were to be asked to subscribe a little to this Mess, which is the Headquarters Mess of the Corps. The Central Mess Fund has given a good deal to this Mess.

Another Officer asked if the entrance fee provided for in King's Regulations could not be devoted to this purpose—two guineas per officer—but it was pointed out that this would be only in the nature of a donation, whereas, to provide a regular income, an annual subscription is required.

Major G. A. D. Harvey: I think if we first started off by getting everybody to subscribe who we think ought to do so, we might then be able to get other officers to subscribe through the Central Mess Fund. With the help of the subscriptions which it is hoped to obtain from officers serving in the London Area, including part of Eastern Command and War Office, we could get a certain amount which would help the Mess to carry on. When this Fund was first started there was a general feeling that it was formed for the benefit of the Millbank Mess, and we thought we ought to give more to other Messes so as to dispel this erroneous impression.

Capt. Clapham: That is quite true. For the first two or three years of the Fund the London Mess went out of its way to avoid making any claim on the Fund. Thus, when the International Medical Congress met in London this Mess paid the heavy expenses of entertaining it without suggesting that they should be met by the Central Mess Fund.

The Chairman suggested that the first thing to do is to try and get all the officers in London to subscribe, and then to take further measures.

Major-Gen. Guise Moores: I suggest that there should be a small additional fund at the disposal of the Mess.

The Chairman: You mean that we should circularize all officers in the Corps, and ask them to pay a small subscription—a certain definite additional sum, over and above the present subscription to the Central Mess Fund, which could be allocated to this Mess—and that all officers should then have the option of using this Mess?

Proposed by General Guise Moores, and seconded by Col. Robinson that the Committee be empowered to take further measures with reference to the subscription of all officers in the London District, War Office and part of the Eastern Command, to the funds of the London Mess; and as to a small additional general subscription. Carried *nem. con.*

(5) The Committee recommended that its provisional constitution (viz., one member from each Command and permanent mess at home, and one representative of each permanent mess abroad) be confirmed.

This was put as a resolution to the meeting by the Chairman and carried unanimously.

(6) It was resolved that Major E. J. Buckley, O.B.E., R.A.M.C., be reappointed auditor for the current year.

SUMMARY OF PROCEEDINGS OF A MEETING OF THE COMMITTEE WHICH WAS HELD AT THE ROYAL ARMY MEDICAL COLLEGE, ON AUGUST 6, 1920.

Present.

Lieut.-Col. P. Davidson, C.M.G., D.S.O., Aldershot Command, in the chair.
Major G. A. D. Harvey, C.M.G., Curragh Mess.
Major G. G. Tabuteau, D.S.O., Woolwich Mess.
Brevet Lieut.-Col. C. G. Browne, C.M.G., D.S.O., Netley Mess.
Brevet Lieut.-Col. W. Benson, D.S.O., Rawal Pindi Mess.
Major E. T. Potts, C.M.G., D.S.O., E. Command.
Major E. C. Phelan, D.S.O., M.C., S. Command.
Major E. M. Middleton, O.B.E., London Mess.
Major D. B. McGrigor, O.B.E., M. Command.

Lieut.-Col. Benson read a letter from the Hon. Secretary, regretting his absence owing to illness, and asked that the regrets of the Committee be conveyed to him.

(1) The minutes of the previous meeting were read and confirmed, but a rider was added that the Sub-Committee should always be convened before a Committee Meeting.

(2) A letter of thanks for help given to that mess was read from the Officer Commanding Royal Army Medical Corps, Bangalore. Also a letter from Messrs. Holt and Co. as to the sale of securities. It was resolved that the Trustees be allowed to sell them up to the amount required, Messrs. Holt and Co. advising as to the nature of the security to be disposed of, having in view the fact that the Central Mess Fund is unlikely to hold securities for any long period.

(3) A letter requesting help was read from the Mess Secretary, Lucknow, and also from the Officer Commanding Royal Army Medical Corps at that station, and statements of the accounts of that mess were submitted.

The Committee realize that the Lucknow mess is in need of help, but consider that the subscriptions and messing charges are inadequate for a mess which is in financial difficulties; they consider that the subscriptions should be brought up to the full amount laid down in the King's Regulations, and that the Mess Secretary be asked to report on the action taken. A resolution to this effect was then carried *nem. con.* It was resolved also that a grant of £200 be made to the Lucknow mess and that the Hon. Secretary be also empowered to send out napery, the cost of which should not exceed £80.

(4) The question was then considered as to what preliminary steps should be taken on the resolution adopted at the last General Meeting as to the subscriptions of all officers in the London District, at the War Office and at Headquarters Eastern Command, to the funds of the London Mess, and as to a small additional general subscription thereto.

The following resolutions were adopted *nem. con.*:—

(*a*) That the Secretary of the London Mess give a detail of subscriptions called for from all Members in the London area (Eastern Command and London District) since the last General Meeting.

(*b*) After these have been received, that he should lay before the Committee what annual grant is required from the Central Mess Fund.

(*c*) That the question of making an extra charge of sixpence a day in the daily messing be considered.

(5) Payment was sanctioned of £26 1s. 10d. to the Anglo-American Nile Company for packing Sir John Roger's collection of heads, as was a grant of £40 to the London Mess towards the necessary repairs in them.

3, *Homefield Road,*
Wimbledon.

J. T. CLAPHAM, *Captain,*
Hon. Secretary.

MILITARY WIDOWS' FUND, BRITISH SERVICE.

THE Military Widows' Fund, British Service, was established in India in 1820 to alleviate the distress of families of officers of the British Service, *serving in India*, and to enable them to return to England without unnecessary delay. Whenever an officer of the British Service, who is a subscriber to the Fund, dies, his family receives at once the following assistance, namely, six months' maintenance allowance ranging from Rs. 2,400 to Rs. 3,600 according to the rate subscribed, plus Rs. 1,500 as a donation for the widow, plus Rs. 500 or Rs. 300 as a donation for each child according to whether the child is over 12 and under 21 years of age or under 12 years of age. These benefits are secured by a small subscription of Rs. 4, 3 or 2 per mensem, which is regulated by the amount of pay an officer draws. An officer, on becoming a subscriber, secures for his wife and children quite irrespective of his length of service in India, the full benefits of the Fund in case of his death after having subscribed for fully three months. In the event of an officer dying within that period, his case is specially considered by the Committee of General Management.

Copies of the regulations of the Fund and other particulars relating thereto can be obtained from the Secretary at Simla.

AUSTRALASIAN MEDICAL CONGRESS, ELEVENTH SESSION, BRISBANE, 1920.

We have received the following communication from the General Secretary of the Australasian Medical Congress.

Resolutions passed at the Special General Meeting of the Eleventh Session of the Australasian Medical Congress, held on Friday, August 27, 1920, to consider the Problem of Tropical Australia in the terms of the Resolution of the Ninth Session, viz. :—

"That it be a recommendation that the principal subject for discussion by Congress at the Brisbane Session should be the question of the possibility of the permanent occupation of Tropical Australia by a healthy, indigenous white race, and the conditions conducive or essential to such occupation."

Resolved :—

1. That—
   (1) The Provisional Resolutions drafted by the Executive Committee be adopted as Resolutions of Congress.

4. That—
   (2) The final paragraph of the Report of the Sub-Committee be adopted as a Resolution of Congress with the substitution of the word "Congress" for the words "Sub-Committee" wherever appearing and with consequential grammatical alterations.

3. That—
   (3) The quarantine defence system be improved and made as complete as possible and that for the purpose of providing urgently necessary public health and general clinical facilities, laboratories properly equipped and staffed should be established without delay at such places as experience shows to be necessary.

2. That—
   (4) The Hookworm Campaign should be extended so as to include amongst its activities the determination of the geographical distribution of filaria, and malaria, and the demonstration of the measures necessary for their eradication; the Governments concerned being asked to make arrangements to this end with the International Health Board.

RESOLUTIONS OF THE EXECUTIVE COMMITTEE.

1.—That it is essential to the effective settlement of the Tropical Australia problem, that the results of scientific investigation and practical experience, be closely correlated with appropriate action; and be made readily available for the study of the various aspects of the problem, and for the guidance of those who are settled, or propose to settle, in Tropical Australia.

2.—That to this end :—

(*a*) The Australian Institute of Tropical Diseases should be enabled to subserve more directly the study of all the problems of health in Tropical Australia, and to carry out inquiry and investigation into all the conditions of life and work there. That the result of the work done by the Institute should be made more generally available for a basis of action.

(*b*) The Federal Government should appoint a special investigator for the collection of statistical and other data bearing on the health of white inhabitants in the Tropical

parts of Australia and on the conditions conducive to healthy settlement there; and for the co-ordination of such data with the results of white settlement elsewhere in the Tropics. He should be attached to the Institute of Tropical Diseases, but special provision should be made for close co-operation in the work by the Federal and State Statistical Departments.

(c) That in connexion with the above, provision should be made for the utilization of the sources of information available from the medical examination of cadets and of school children, and that the Government Departments concerned be urged that in future these examinations should be so conducted as to elicit data bearing on the influence of Tropical conditions on the physical development of the white race.

(d) That the Governments concerned, Federal and State, should, without delay, organize some system for the dissemination of exact scientific and practical knowledge on the requirements, personal and communal, essential to healthy life in the Tropics; such information being based on investigations and observations already made, here and elsewhere, and on that to be carried out in the future in accordance with (a), (b), and (c) hereof.

(e) That legislation, Federal, State, and Municipal, should be undertaken with the object of insuring, so far as is possible by such means, that the mode of life in Tropical Australia, personal and communal, be such as best suits the conditions. Such legislation might embody, e.g. :—

i. Discouraging extensive consumption of alcohol.
ii. Planning of towns and houses.
iii. Provision for recreation ; open spaces in and about towns ; playgrounds, &c.
iv. The most suitable hours for working (schools, factories, public departments, &c.)
v. Provision for readily available periodical change from the coast to the hinterland; and for communication with the south by land and sea at cheap rates.
vi. Encouragement of all industries specially suitable for Tropical Australia.
vii. Assisted immigration of suitable persons of white races, e.g., domestic servants: and the combating of prejudice and ignorance with regard to life and living condition in Tropical Australia.
viii. A land system calculated to encourage settlement by a working white race.
ix. Steps calculated to promote an understanding with neighbouring civilized races, other than white, whereby the mutual advantage of the avoidance of hybridism and the perpetuation of pure races be made the basis of international agreement and mutual co-operation.

3.—That to effect these and other essential ends in connexion with the health of the community in Australia, the appointment of a Federal Ministry of Health would be the most effective system of organization, and is a measure of immediate national importance.

4.—That the development and settlement of Tropical Australia by a working white race cannot be effected without expenditure. If the Australian Nation wills the End, it must also will the Means.

Conclusion.

(*Final Paragraph of Report of Sub-Committee*).

After mature consideration of sources of information embodying the results of long and varied professional experience and observation in the Australian Tropics, the Congress is unable to find anything pointing to the existence of inherent or insuperable obstacles in the way of the permanent occupation of Tropical Australia by a healthy indigenous white race. It considers that the whole question of successful development and settlement of Tropical Australia by white races is fundamentally a question of applied public health in the modern sense, such as has been demonstrated and practised with success amongst civil populations, under far more difficult conditions, by the American Authorities in the Philippines prior to the Great War, and throughout the military forces of every allied Power during that War. It considers that the absence of semi-civilised coloured peoples in Northern Australia simplifies the problem very greatly. But it desires to emphasize in the strongest manner that any considerable extension of population and settlement under the existing loose conditions of sanitary administration and sanitary practice, using these terms in their modern wider sense, which prevail at the present time in Tropical Australia, cannot hope for lasting success, and cannot fail to result in ultimate disaster. The Congress recognizes that a large amount of work still requires to be done in working out the practical details of any scheme of settlement, but it considers that it presents no difficulties beyond those of organization, staff, time, and money. It realizes that a great national question is involved, but it is unable to discern any obstacles which cannot be overcome by earnest and skilful application of the principles of statecraft.

EXCHANGES, &c.

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